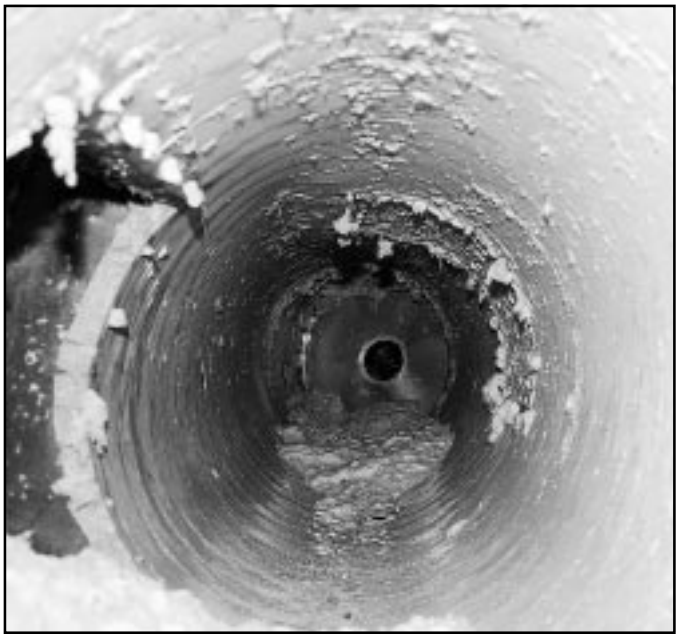
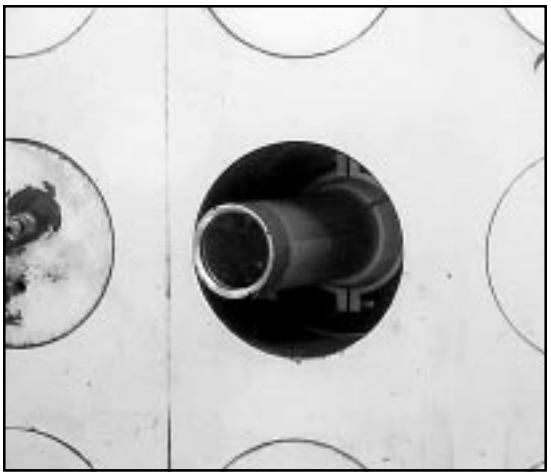
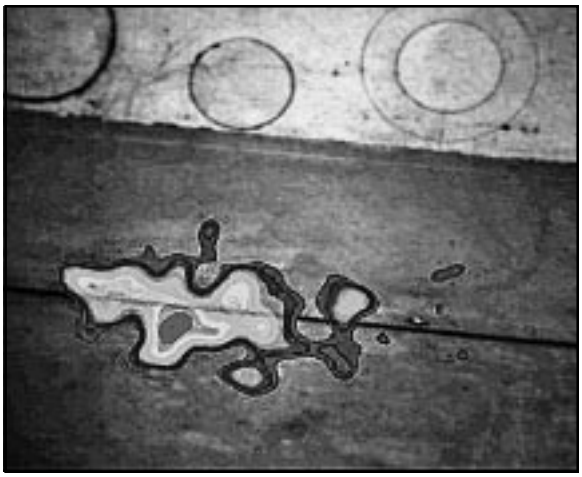
Deactivation and Decommissioning Focus Area

QUARTERLY REPORT

July — September 2002 Activities







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D&D Focus Area

On the Cover—327 Building Canyon

Top: Fogging is intended to adhere the contamination floating in the air to surfaces (i.e. small particles.) Excessive Lint in the CFA-617 ducting prevented the fogging from making a difference.

Lower left: The Cartogam gamma camera inserted through a 327 Building hot cell port to permit "pictures" to be taken of the opposite wall and floor.

Lower right: The Cartogam gamma camera identifies apparent contamination in and along the floor pan seam of the 327 Building G-Cell.

The purpose of this document is to provide an overview of the Deactivation and Decommissioning Focus Area (DDFA) and to update readers on the programs current activities. It presents a synopsis of the current program status and recent accomplishments, along with an overview of planned activities, program issues, and opportunities. Quarterly reports are distributed to U.S. Department of Energy (DOE) headquarters and operations office managers, site personnel, site operating contractors, technology developers, principal investigators, regulators, and other stakeholders. Issued four times a year, the DDFA quarterly reports summarize the activities of each quarter. Quarterly reports and further information about the DDFA are found on the web at *http://www.netl.doe.gov/dd*. Technologies are identified by their discrete tracking numbers within the Technology Management System (TMS) operated by DOE's Office of Science and Technology (OST). Providing access to information about OST programs, technologies, and linkages to environmental management (EM) problems, TMS is on the web at *http://tms.em.doe.gov.*

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D&D Focus Area

1.0 HIGHLIGHTS

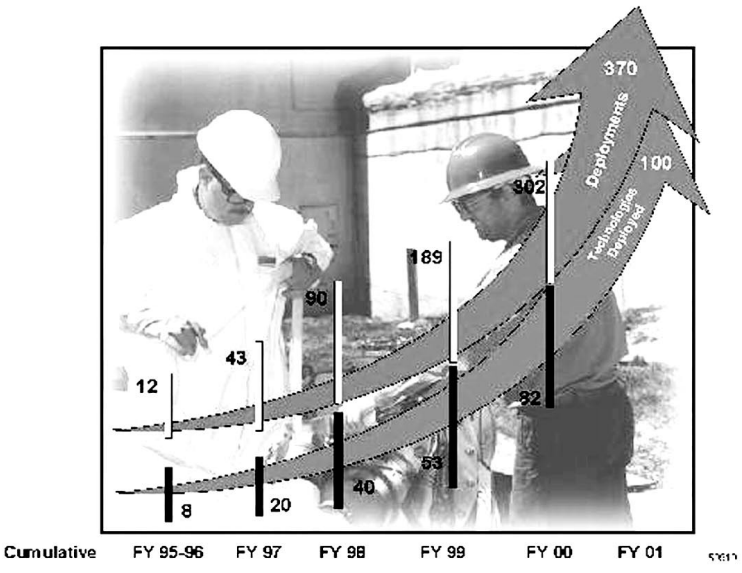
The Deactivation and Decommissioning Focus Area (DDFA)

The Deactivation and Decommissioning Focus Area (DDFA) effectively introduced improved decontamination and decommissioning (D&D) technologies and techniques to the DOE complex from 1995, when it was first transferred to the National Energy Technology Laboratory (NETL), to 2002. The success of the program is the result of the hard work and dedication of many individuals and the DDFA would like to extend its gratitude all those who contributed to its success. These include the Site Technology Coordinators, the technology selection team members, technology developers and vendors, DOE Headquarters staff, Technical Program Officers, site contractors, principal investigators, project managers and engineers who have helped bring the DDFA onto the Environmental Management (EM) sites to clean up the legacy of nuclear materials and weapons production.

At the conclusion of fiscal year 2002 the DDFA will come to a close, leaving behind a proud legacy. The D&D Focus Area's mission was to identify, develop, demonstrate, and assist in the deployment of improved D&D technology systems which reduce costs, minimize radiation and chemical exposures and improve worker safety, and accelerate schedules for the deactivation, decontamination, and decommissioning of DOE's radiologically contaminated surplus facilities. From real-time characterization to robotic systems, improved technologies emerging from this program are more effective, more productive, less costly, and more protective of worker safety and health.

During its lifetime, the DDFA's strategy was to focus efforts on its cornerstone program, the Large Scale Demonstration and Deployment Projects (LSDDP's), as well as on technologies that addressed high-priority customer needs, had wide applicability, and had customer commitment for use on future projects. DDFA emphasized demonstration and deployment of private-sector technologies. The purpose of the LSDDP's was to showcase commercially available, improved technologies in D&D projects, validate their cost and performance against baseline techniques, and then disseminate the technologies for deployment across the DOE complex.

In an LSDDP, suites of improved technologies available in the private sector or developed within the DDFA, but not yet deployed in the DOE complex, were demonstrated alongside competing baseline technologies as part of DOE's ongoing D&D efforts. Full-scale demonstration of technologies within site D&D projects provided meaningful cost and performance data to potential end users. Successfully demonstrated technologies were available for immediate deployment on the remaining portion of a particular problem within that project as well as for similar problems throughout the DOE complex.



In January 1996, the DDFA selected three initial sites to host LSDDP's. These sites were Argonne National Laboratory (ANL), Fernald, and Hanford. Additionally, in March 1998, the DDFA selected four new sites to host LSDDP's. These were the Los Alamos National Laboratory (LANL), the Mound site, the Savannah River Site (SRS), and the Idaho National Engineering and Environmental Laboratory (INEEL). In 2001, three more LSDDP's were initiated at the West Valley Demonstration Project, INEEL and LANL. The latter INEEL and LANL projects were Model B LSDDP's, which emphasize deployment of under-utilized technologies.

Key to the success of the LSDDP concept and the DDFA program was the strong collaboration among government, national laboratories, academia, and private sector firms, including technology developers, D&D contractors and nuclear power utilities. DDFA, together with an integrated team of technical experts, supported ten large-scale projects during its lifetime. In total, 105 technologies were demonstrated within the LSDDP program. Of these, 63 have been deployed over 320 times between 1996 and 2002 (chart. pg. 3).

The Office of Environmental Management's Accelerated Site Technology Deployment (ASTD) projects were another tool used by the DDFA in fulfillment of its mission. Designed to expedite the cleanup of DOE sites by breaking down financial and organizational barriers to the implementation of new technologies, the DDFA implemented nearly thirty ASTD's during its existence. Collectively, these ASTD projects deployed more than 50 technologies in seven years.

Effective coupling of the LSDDP with other site-specific initiatives and ASTD projects has resulted in over 415 deployments since 1995, with the high-water mark in 2000 when 124 deployments were successfully achieved. Our success has resulted in several awards (sidebar).

While the DDFA was accomplishing a positive impact on the sites' cleanup missions we were also reaping a positive return on the American taxpayer's dollar. In fact, by September 2002, approximately 112 million dollars had been spent by DDFA to bring better D&D technologies to the sites. Through continued deployment of its improved technologies, the DDFA projects over 2 billion dollars in cost savings over the lifetimes of various D&D projects throughout the complex. This represents a return on investment in excess of 20:1.

External Recognition

- D&D of CP-5 Reactor at Argonne National Laboratory—**HAMMER Award** and voted **One of DOE's 100 Best Technological Accomplishments of the Century**
- Savannah River's 321-M project—**Pollution Prevention Award** for Outstanding Technology Transfer Effort
- **R&D 100 Award** (1999)—Asbestos Conversion Project
- **Energy 100 and Excellence in Design Competition Award**—Asbestos Pipe Removal Robot System
- **1996 R&D 100 Award**—3M Empore™ Membrane

The program's successes are too many to list, but some examples clearly show the impact we have made.

- The Chicago Pile CP-5 Research Reactor at ANL introduced several very successful D&D technologies to the DOE complex such as the GammaCam(tm) and the In Situ Object Counting System (ISOCS).

More importantly, it served as the prototype LSDDP for the DDFA;

- The Hanford 105-C Reactor LSDDP helped establish interim safe storage (ISS) status for the reactor, reducing the footprint by 81%; ISS will be used on the remaining Hanford production reactors, saving an estimated $484 million;
- The Fernald Plant 1 LSDDP introduced the Oxy-gasoline Torch and the Personal Ice Cooling System, which have become two of the most widely used technologies in the DOE complex;
- The Mound Tritium LSDDP introduced NOCHAR, a polymer material that can absorb and solidify tritiated organic wastes. NOCHAR is becoming one of the most popular means of stabilizing and disposing of mixed-waste in the DOE complex
- The INEEL and Associated Facilities Fuel Pools and Material Dispositioning Model B LSDDP will deploy new or improved D&D technologies for fuel pools and associated facilities and deploy improved technologies for material dispositioning. These deployments will be staged at various sites including SRS, Mound, Fernald, Hanford, OR and INEEL. Already, this project has deployed Alloy Analyzer, Paint Scaler, Ultralift Motorized Handcart, Paint Lifter, Paint Scaler, Remote Underwater Characterization System (RUCS), Air Pallets, Evolution 180 Circular Saw, Powered Air Purifying Respirators (PAPRS), FIU Scabbler, and Heat Stress PILL.

The DDFA will wind down at the end of FY 2002. EM conducted a Top to Bottom review in FY2001 and initiated a transition to a new approach to D&D of EM's facilities. This resulted in the termination of the focus area approach at the end of Fiscal Year 2002. We at NETL wish to thank each of our partners for your participation and contribution to the success of DDFA, and we wish you continued success in the future.

2.0 Project Summary Table

The following table summarizes the Technical Task Plans for the D&D Focus Area Core Program and related Crosscutting and Industry Program contracts. Project descriptions follow in subsections 2.1 through 2.4 and are organized by the work breakdown structure (WBS) element listed here.

TTP Number	WBS Element	Project Name	Page
AL08DD21	Demonstrations and Industry Approaches	LSDDP: LANL TRU Waste Characterization, Decontamination, and Disposition	08
OH08DD21	Demonstrations and Industry Approaches	LSDDP: Mound Tritium Facilities D&D	09
ID01DD11	Demonstrations and Industry Approaches	LSDDP: INEEL and Associated Facilities Fuel Pools and Material Dispositioning	13
AL11DD31	Demonstrations and Industry Approaches	LSDDP: LANL Tritium Facilities D&D	14
OH01DD11	Demonstrations and Industry Approaches	LSDDP: WVDP Hot Cell D&D	15
RF09DD21 RF08SD10 RF09DD61	Demonstrations and Industry Approaches	Rocky Flats Environmental Technology Site D&D Initiative and Associated ASTD Projects	16
OH21DD31	Demonstrations and Industry Approaches	Mound Facilities Long-Term Stewardship Initiative	22
OH19DD61	Demonstrations and Industry Approaches	ASTD: Integrated Excavation Control System	22
RL09DD61	Demonstrations and Industry Approaches	ASTD: Remote Size Reduction for Large Hot Cell Deactivation	23
AL08SD10	Demonstrations and Industry Approaches	ASTD: LANL Decontamination and Volume Reduction System	24
NV09DD61	Demonstrations and Industry Approaches	ASTD: Oversize TRU Waste Laser Cutting System	24
OH00DD31	Demonstrations and Industry Approaches	ASTD: Intrusive and Non-Intrusive Characterization through Concrete Walls and Floors	25
SR01DD22	Demonstrations and Industry Approaches	ASTD: Demonstration & Deployment of Remotely Operated Size Reduction System	26
RL01DD11	Demonstrations and Industry Approaches	ASTD: Deployment of Improved Technologies for Cleanout of the F-Reactor Fuel Storage Basin	26

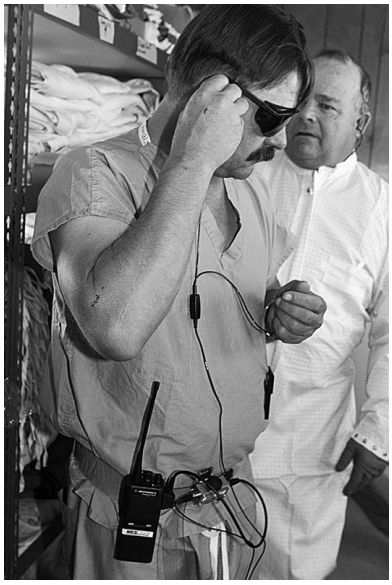
2.1 Demonstration and Industry Approaches

Los Alamos National Laboratory (LANL) Transuranic (TRU) Waste Characterization, Decontamination, and Disposition Large-Scale Demonstration and Deployment Project (LSDDP)

Objective and Scope: The LANL TRU Waste Characterization, Decontamination, and Disposition LSDDP addresses the characterization, decontamination, and volume reduction of oversized metallic TRU waste currently in storage at TA-54, LANL's storage and disposal area. The LANL TRU LSDDP reflects the cooperative interest of industry, government, and academia to bring collaborative expertise and strength to the DOE TRU decontamination and decommissioning (D&D) program at LANL and elsewhere within the DOE complex. LANL currently has 1,500 cubic meters of TRU waste in inventory, stores 313 plutonium-contaminated gloveboxes in a 24,000-square-foot facility, and expects to generate another 2,500 cubic meters from ongoing operations in coming years.

The major objectives of this LSDDP are to:

- Identify technologies that are ready for deployment for the characterization, decontamination, and volume reduction of TRU waste/TRU contaminated metallic objects
- Identify technologies that are ready for demonstration
  - Demonstrate those technologies with potential to reduce cost, risk, and schedule and that are amenable for direct field application at LANL and elsewhere in the DOE complex
  - To the extent possible, compare technologies side-by-side with baseline approaches to evaluate their advantages (cost, risk, and schedule) and to refine or validate baseline assumptions
  - Capitalize on the combined corporate management and technical strength of private industry, government, and academia
- Demonstrate a leveraged funding pool of federal and private monies via cost sharing to address issues of national importance
- Provide ready access to demonstration results through an aggressive communication program



RaceScan was demonstrated at the LANL TRU LSDDP for the improvement of communication between workers.

Status and Accomplishments: The following demonstrations have been completed: AeroGo Air Lift Pallet System (Tech ID 2396), Vehicle and Cargo Inspection System (VACIS) (Tech ID 2912), Mega-Tech Blade Plunging Cutter (Tech ID 2953), NT Vision System (Tech ID 3069), Mobile Characterization System (Tech ID 2959), RaceScan (Tech ID 3129), Fog and Strip (Tech ID 3143), and an electrochemical decontamination technology.

Current Reporting Period Activities: In September, the Environmental Alternatives, Inc. (EAI) glovebox decontamination demonstration and an application of the Rocky Flats cerium nitrate technique, also used on a Los Alamos glovebox, were completed.

For more information:

http://www-emtd.lanl.gov/LSDDP/DDtech.html

Tech ID 2203

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The Mound Plant, Miamisburg, Ohio commenced operationin 1948.

▼Mound Tritium Facilities D&D LSDDP

Objective and Scope: The Mound Plant in Miamisburg, Ohio began operations in 1948. The site's mission, originally to fabricate the neutron initiator for the atomic bomb, expanded to include research, development, and production of numerous nuclear and nonnuclear weapons components, production of radioisotopically fueled thermoelectric generators, and surveillance of nuclear weapons components.

The objective of the Mound Tritium Deactivation and Decommissioning LSDDP is to identify, demonstrate, and evaluate innovative technologies applicable to D&D of tritium facilities. D&D of Mound's surplus tritium facilities, the T and R/SW Buildings, provides a unique opportunity to compare, evaluate, and eventually execute innovative D&D technologies alongside baseline technologies in an ongoing project. The Mound LSDDP will identify and explore methods to improve worker safety while achieving cost and schedule savings. The project is expected to identify technologies that, when implemented in the Mound LSDDP, will produce significant savings compared to the $57.8 million baseline. The results and successes of this demonstration project will benefit similar DOE facilities and projects.

The T Building is an underground, reinforced-concrete structure built in 1948 for the purification of polonium-210 used in nuclear weapons initiators. Later the facility was used to extract other radionuclides, house the plutonium verification facility, and store TRU materials. Facilities large enough to handle multi-kilogram quantities of tritium were added to the building. Current plans are to decontaminate T Building to allow potentially unrestricted public reuse by the year 2003. The SW Complex and one corridor of rooms in the adjacent R Building form the SW/R Complex. Four types of operations have been performed in these facilities to support nuclear weapons programs using tritium: component development, component evaluation operations, tritium recovery, and material analysis. To meet DOE's vision of completing the environmental restoration of the site by 2005, the SW/R Complex will be demolished, and contamination beneath the building will be removed.

The Mound LSDDP Integrating Contractor (IC) Team includes the following: Babcock & Wilcox of Ohio; Lawrence Livermore National Laboratory (LLNL); British Nuclear Fuels Limited (BNFL); Foster Wheeler; IT Corp; LANL; Westinghouse Savannah River; Princeton Plasma Physics Laboratory (PPPL); and FIU.

Status and Accomplishments:
Completed Demonstrations:

1. Portable Scintillation Counter (Tech ID 2311):

The Lumi-Scint portable scintillation counter is a portable, single-tube liquid scintillation counter that can be set to respond to the low-energy beta radiation emitted from tritium. It uses a single photomultiplier tube and manual sample chamber. The Lumi-Scint operates on an internal battery or 110 VAC. The unit can be obtained with a printer to produce hard copies of its electronically stored data.

The Lumi-Scint portable scintillation counter is a portable, single-tube liquid scintillation counter that can be set to respond to the low-energy beta radiation emitted from tritium

2. Water Solidification (Tech ID 2312):

This technology uses a polymer-based absorbent, WaterWorks SP-400 that can be used to solidify aqueous waste. It is similar to other polymer-based absorbents that offer benefits over traditional solidification agents such as cement or Aquaset, the baseline solidification agent for the Mound facility. Benefits include the following: a high liquid-to-absorbent ratio; no mechanical mixing required to promote the absorption process; little to no volume increase in the waste after

addition of the absorbent; and very high retention in the form of the gel-like material.

3. Oil Solidification (Tech ID 2313):

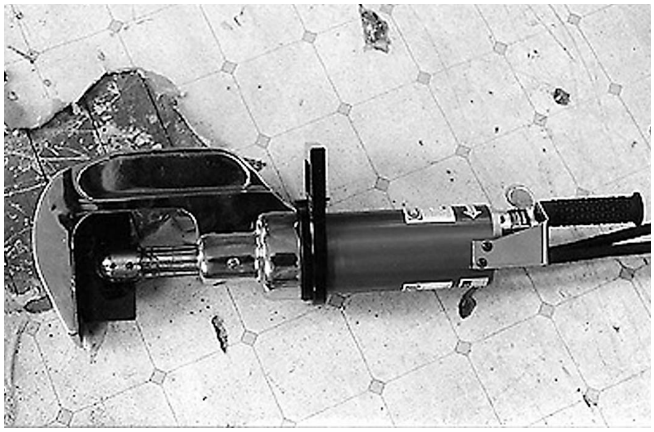
This contaminated oil solidification technology, Nochar PetroBond(r), is a high-quality polymer offered by Nochar, Inc., of Indianapolis, Indiana, and is specifically designed as a petroleum-based liquid absorbent. The Nochar PetroBond(r) absorbs very quickly with little increase in volume. The Nochar PetroBond(r) can be used for free-liquid control in storage, transport, and disposal of low-level radioactive waste.

4. Tritium Cleanup Cart (Tech ID 2974):

The Tritium Cleanup Cart is a portable tritium processing system. Used as a stand-alone cart for scrubbing tritium effluent, it provides a scrubbing process based on catalytic oxidation of tritium. Tritiated water is collected on removable molecular sieve dryers, which can be shipped as low-level waste below the 1080 curie "Type A" limit. The unit provides a projected decontamination factor of greater than 1000, with a process flow rate of 45 liters per minute. Design features include the following: mole sieve dryer beds configured in series with moisture monitors to prevent moisture breakthrough; process flow controllers in the main plumbing loop and air inlet system; process thermocouples, which provide process stream and enclosure over-temperature control; and an enclosure that can function as a ventilated hood during normal operating conditions, but also can be isolated when tritium concentrations inside the enclosure exceed the pre-selected control set point.

5. Pipe Cutting and Crimping System (Tech ID 2955):

Burndy Products Pipe Cutter



The Pipe Cutting and Crimping System is a small, hand-held, battery-operated crimping tool manufactured by Burndy Products. This tool uses a separate hydraulic pump with a high-pressure hose connecting the pump to the crimping head. U-shaped dies are contained in the head for crimping. A battery-powered hydraulic pump or an electric-powered pump can be used to develop 10,000 pounds per square inch (psi) of pressure to the crimping head. Thirty crimping operations can be performed before recharging is needed. The small dimension and light weight make this tool very suitable for crimping in tight quarters.

6. TechXtract(r) Chemical Decontamination of Metals (Tech ID 1450):

TechXtract(r) is a contamination extraction technology that uses chemical formulations to remove contaminants from matrix surfaces and subsurfaces. Different chemical formulations are used for removal of specific contaminants from metal surfaces and subsurfaces. In this demonstration, the technology successfully decontaminated volumetrically contaminated stainless steel equipment. The demonstration showed greatly improved decontamination efficiency compared to the baseline method of decontamination using hydrogen peroxide.

7. Heavy Metals Removal from Mixed Waste Oils Using Self Assembled Monolayers on Mesoporous Supports (SAMMS) (Tech ID 1447):

The SAMMS technology was developed by Pacific Northwest National Laboratory (PNNL) for removal and stabilization of Resource Conservation and Recovery Act (RCRA) listed metals (i.e., lead, mercury, cadmium, silver, etc.) and for removal of mercury from organic solvents. The SAMMS material is based on self-assembly of functionalized monolayers on mesoporous oxide surfaces. The unique mesoporous oxide supports provide a high surface area, thereby enhancing the metal-loading capacity. SAMMS material has high flexibility in that it binds with different forms of mercury, including metallic, inorganic, organic, charged, and neutral compounds. It removes mercury both from organic wastes such as pump oils and from aqueous wastes.

8. Barter Process (Tech ID 3062):

The Equipment Reuse, Bartered Sale of Used Contaminated Equipment to a Commercial Company (Barter Process)

was demonstrated. As a closure site, much of the DOE Miamisburg Environmental Management Project's (MEMP) equipment is planned for disposal. The Mound LSDDP team, instead of considering disposal as a first option, has demonstrated that there are numerous benefits to the reuse of equipment at another facility or company over disposal. They completed a process to transfer used, tritium-contaminated equipment to a commercial company by means of a bartered sale agreement, to a Texas-based Nuclear Regulatory Commission (NRC) licensed pharmaceutical company. The Mound LSDDP team effectively applied the process knowledge and methodology developed by the DOE National Center of Excellence for Metals Recycle (NMR) in Oak Ridge to facilitate equipment reuse at many DOE sites. A Bartered Sale agreement was negotiated, and the first shipment of used equipment completed. Additional shipments will follow. As a result, DOE expects to avoid over $400,000 in equipment disposal costs and an additional $1 million by shortening the schedule for site closure.

9. Electret-Passive Environmental Radiation Monitor (E-PERM) (Tech ID 2315):

The E-PERM® is a commercially available instrument designed to provide faster and less expensive means of determining the tritium contamination in air and on solid surfaces. For measurement of airborne tritium, the E-PERM® uses a chamber made of carbon filled polypropylene and a window made of thick carbon-coated Tyvek™ material, which is highly transparent to water vapor. For tritium surface monitoring, the E-PERM® system is used in a windowless mode. A mesh, supplied by the manufacturer, is used over the surface of a contaminated object before deploying the electret ion chamber to prevent contamination of the chamber.

10. Waste Isolation Composite (WIC) (Tech ID 3061):

WIC is an ultra-high-strength composite material with high durability and low permeability that can be used for isolation or encapsulation of high-activity tritiated liquids. This is especially useful for disposal of liquid waste with high curie content tritiated water. Structural integrity tests were completed and the composite's performance was satisfactory.

11. Fiber-Optic Tritium Detector and Quantifier (Tech ID 2956):

This technology, developed by McDermott Technologies, Inc., uses a fiber-optic bundle coupled to a photomultiplier tube detector to measure low-energy beta radiation from radioactive decay of tritium. It allows the fiber bundle to be introduced directly in the liquid (oil or water) sample for tritium detection and quantification.

12. Liquid Scintillation Vial Shredder and Disposal (Tech ID 3066):

This technology developed as a follow-up to the successful demonstration and wide deployment of oil solidification (Tech ID 2313). The process has proven very successful for disposal of liquid scintillation counting (LSC) vials used for laboratory analysis. The technology uses a mechanical shredder to crush the vials containing scintillation cocktail. It captures the shredded vials in a net area and the scintillation cocktail in a drum for treatment with NOCHAR N991. During the demonstration, five 55-gallon drums containing about 73,650 vials of LSC waste were processed. Following the successful demonstration, the shredder and disposal processes were deployed at Mound in June 2001.

13. TechXtract(r) Chemical Decontamination of Concrete (Tech ID 1450):

TechXtract® chemical treatment to remove surface (and potentially near-surface) contamination from concrete was conducted in a tritium laboratory at LLNL. Data were collected to measure the tritium-rebound effect and to measure performance of the technology for removing below-surface contamination. An additional application of the TechXtract® process was needed to eliminate the sources of rebounding contamination. Primarily this turned out to be migration from untreated floor areas adjacent to the test patch. The earlier crack source hypothesis appears less important. Success followed two thorough treatments of the entire lab floor space.

14. Tritium Concrete Characterization (Tech ID 3065):

The Tritium Concrete Characterization Process allows profiling of contamination in depth in floors, walls, and ceilings. The process uses a hollow core hammer drill that is coupled through a rotating seal to a vacuum line and sampling train. All of the particulates generated from the drilling operation are removed by the high-flow vacuum system and are captured in a high efficiency particulate air (HEPA) filter cartridge. The particulates are then transferred to a sample vial and a field measurement of the contamination level is carried out in a portable liquid scintillation counter. The leach testing on radioactively contaminated samples initiated in mid-September has been completed.

15. Tritiated Monitoring System (TMS 2000) (Tech ID 2933):

The innovative technology demonstrated is a portable, hand-held, tritium-contamination detector capable of detecting tritium on a flat surface by direct contact, or measuring tritium activity on a smear by placing a smear in a special "drawer" on which the detector is placed over the smear. This detector is easily transported into the field to allow for quick turn-around time in the measuring of tritium contamination. The final phase of the demonstration involved operating the unit in a smear counting mode. The smear data has been analyzed and the data package compilation is expected to be completed in January.

Current Reporting Period Activities:

Updates on Completed Deployments:

- ***Mound (Tritiated Oils and Scintillation Vials):***

Mound continues to solidify its tritiated oil (1,200-1,500 gallons total), with radiation levels up to 2,000 Ci/liter, and additional inventories of organic waste being uncovered as the Site D&D continues. Presently an estimated 25% of the waste curie inventory is packaged and awaiting shipment to NTS.

The Nochar cutting/shredding machine that had solidified the contents of 200,000 vials of scintillation cocktail for disposal has been repaired and operators are periodically working. A backup blade assembly module that incorporates a significant engineering improvement was delivered to the site. This technology continues to show great success in eliminating the site's inventory of LSC waste. Work has started with Waste Control Specialists in Texas to re-solidify and package some Mound tritiated oil (15,000 curies) that contains free liquids after treatment with "vermiculite" several years ago. This re-packaging project will continue through the remainder of the calendar year. Data from this project will be useful input for inventories of failed solidified waste that exist elsewhere in the DOE complex.

- ***Sandia (MLLW Oils):***

A successful deployment in May 2000 tested Nochar with hydraulic oil, various vacuum-pump oils and a two-phase oil, and these small waste streams were solidified and eliminated. Sandia had started to process about 900 gallons (45 drums) of partially stabilized (with "oil dry") waste with Nochar, by transferring the clay and liquid to new Nochar-loaded containers and rotating the containers on rollers to mix the material together. The actual mixing process was delayed but is now expected to resume in early October.

- ***Rocky Flats (TRU Oils):***

About 40 drums of TRU waste oils from inventory and from the Oil and Solvent Immobilization System (OASIS) have been stabilized with Nochar-loaded bags and granulated activated carbon (GAC) pads. The site is completing the testing of these drums. Test results from the first fully sampled drum (with the highest Pu loading) were excellent. Shipment to the Waste Isolation Pilot Plant (WIPP) is expected early next year.

The site had requested and received from Nochar several versions of a “Point-of-Generation Kit” for on-the-spot solidification capability of TRU and LLW oils found during D&D activities. RFETS is working off its existing inventory of N990 polymer and delaying a decision on which version of these kits it will use. These POG kits have great potential in streamlining the waste treatment process, resulting in schedule and cost savings.

A site report was received that an ammonia vapor was experienced in the process of mixing Nochar with some of the strong alkaline liquid wastes. Nochar confirmed that its polymers would not emit an ammonia vapor, and helped to resolve this issue by locating an impregnated carbon product that can be placed at the top of the waste container to absorb 99% of the ammonia odor. It has provided this

information to Rocky Flats and issued an industry bulletin regarding this issue and corrective action. The Nochar products continue to be the primary site technology now for solidification operations as confirmed by site DOE officials who have been in direct contact with Nochar Management.

Other Nochar deployments include:

- Savannah River-is proceeding with stabilization of the PUREX waste stream.
- Whiteshell, Manitoba-has solidified its legacy organic heat transfer fluid with a special blend of Nochar polymers and placed it into six stainless steel B-25 boxes for long-term storage.
- Hanford (Office of River Protection)-Nochar was used to solidify a Hanford tank simulant sample, provided by the Savannah River Technology Center, a s a proof-of-principle test.
- Oak Ridge at Y-12-Nochar successfully solidified a small quantity of aceto-nitrile. They are preparing to proceed now to test with the actual waste stream. ORNL also solidified a small waste stream of approximately five gallons of vacuum pump oil that contains uranium, tritium and mercury with Nochar plus SAMMS.

For more information:

http://www.doe-md.gov/lsdd/lsdd.htm

Tech ID 2201

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▼INEEL and Associated Facilities Fuel Pools and Material Dispositioning LSDDP

Objective and Scope: This LSDDP will deploy new or improved D&D technologies for fuel pools and associated facilities will demonstrate and deploy new or improved technologies for material dispositioning. This project will facilitate complex wide deployments of technologies proven successful in previous LSDDPs. These demonstrations and deployments will be targeted at Integrating Contractor (IC) Team member sites including Savannah River, Mound, Fernald, Hanford, Oak Ridge, and the INEEL.

This LSDDP will demonstrate and/or deploy innovative or improved technologies a minimum of 14 times over the life cycle of the project. Additional demonstrations and deployments will be conducted if the demonstrations/deployments are substantially cost-shared by technology vendors and DOE site operations. The goal of this project is to conduct as many demonstrations and deployments as possible within the allotted funding while selecting technologies that have the most substantial positive impacts to deactivation and decommissioning projects within the DOE weapons complex. These impacts include cost reduction, schedule acceleration, reduced exposure to radiation, and improved worker safety.

Status and Accomplishments:

The kickoff meeting for the IC Team was held on September 30, 2001. This LSDDP has deployed several technologies:

1) the Alloy Analyzer (Tech ID 2397) at Mound on January 14, 2002;
2) the Paint Scaler (Tech ID 2952) at Test Area North (TAN) 616 to sample lead bricks December 2001-February 2002;
3) the Ultralift Motorized Handcart (Tech ID 3142) at INEEL on February 7, 2002;
4) the Paint Lifter at TAN 616 for preparati on for torch cutting on February 14, 2002;
5) Paint Scaler at Hot Laundry Facility to collect paint samples on March 13, 2002;
6) Remote Underwater Characterization

New or improved D&D technologies for fuel pools at INEEL and associated facilities

System (Tech ID 2151) at PBF to characterize reactor pools and canals on March 25, 2002;

7) Paint Scaler at INEEL on April 2, 2002;
8) the Ultralift Motorized Handcart at INEEL on June 11, 2002;
9) Remote Underwater Characterization System (RUCS) at INEEL on May 1, 2002;
10) Air Pallets at INEEL on May 14, 2002 and on June 26, 2002;
11) the Evolution 180 Circular Saw at Columbus Environmental Management Project (CEMP) on May 29, 2002;
12) the Evolution 180 Circular Saw at INEEL on April 18, 2002;
13) the Powered Air Purifying Respirators (PAPRS) at INEEL on June 26, 2002;
14) the FIU Scabbler at Ashtabula onJune 26, 2002; and
15) the Heat Stress PILL at Oak Ridge on June 26, 2002.

The International Union of Operating Engineers (IUOE) visited the INEEL April 15 through April 18, 2002 to perform human factors assessments on new or improved technologies deployed on this project. Ten technologies were evaluated during the visit. Among the technologies assessed were the Alloy Analyzer, the Niton Multi-element Analyzer, the Surveillance and Maintenance System (SAMS), Air Pallets, the Ultralift Motorized Handcart, the Supersleever, the RUCS, and the BROKK Compact Remote Console.

Current Reporting Period Activities: The following technologies were deployed in the July-September timeframe: 1) Paint Lifter at INEEL on August 1, 2002; 2) Heat Stress PILL at Hanford on September 4, 2002; and 3) SAMS at INEEL on September 10, 2002. This project was cancelled by DOE Headquarters and a Closure Status Report has been issued.

For more information:

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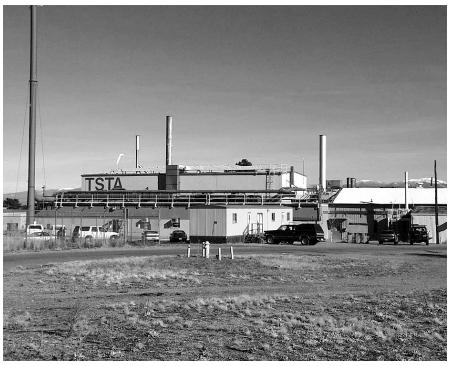
LANL Tritium Facilities (Model B) LSDDP



Los Alamos National Laboratory (LANL) Tritium Facilities

Objective and Scope: The objective of the Los Alamos National Laboratory (LANL) Tritium Facilities (Model B) LSDDP is the reduction of cost, risk, and schedule for the deactivation, decontamination, and decommissioning of DOE's tritium facilities through the deployment of previously demonstrated, cost-effective, innovative technologies. The goal of this LSDDP is to identify and select at least 20 technologies that can be deployed at multiple sites. At LANL, leveragable funding of $6.6 million is available over two years of the project. Leveragable funding from other sites is expected as well.

The primary deployment site for this LSDDP will be the LANL Tritium Systems Test Assembly (TSTA), an existing facility that is being stabilized by the current DOE program operator, the Office of Fusion Energy Science (OFES), in anticipation of transfer to EM for decontamination and decommissioning. The facility is operated for the OFES by LANL at Technical Area 21. The main experimental building is a 3700 square-foot high bay that contains process equipment and gloveboxes for fusion tritium R&D. TSTA presently has a tritium inventory of 127 gm, which is the focus of the current stabilization activities. The TSTA tritium is in four forms: 1) gas in 50-liter tanks (about 20 tanks with approximately 40 gm tritium); 2) a solid adsorbed on metal hydride beds (11 beds holding approximately 40 gm

tritium and containing 50 kg of depleted uranium); 3) water on molecular sieve "moisture collectors" (currently about 40 containers holding a total of approximately 40 gm tritium); and 4) "holed up" in high surface area components (5-20 gm tritium).

Technology	# Site
LLNL Tritium Clean-up Cart	1
Burndy Hydraulic Crimper	3
DBATs	1
Evolution 180 metal cutting saw	6
Hammer Drill	2
Lumiscint/Beta Triathler	3
Portable Tritiated Water Removal Unit	1
Race Scan communication system	4
Rad Elec beta detector	2
Vial Crusher	1
Mega-Tech Cutter	1

This LANL Tritium LSDDP will facilitate expedited facility closure with the application of innovative technologies. Furthermore, the facility will become a model for implementation and deployment of innovative technologies at other DOE tritium facilities. The impact will be that the technologies deployed in this LSDDP will become the baseline technologies for future tritium facility closure operations.

Status and Accomplishments:

The table following provides a numerical tabulation of deployments completed or initiated in FY02.

These deployments represented a wide variety of contributions including:

- Purchase of equipment for deployment by the site, such as the Lumiscint/Triathler deployment to reduce the cost and time for tritium analyses at the LANL Tritium Systems Test Assembly (TSTA)
- Purchase of equipment for inclusion in larger systems, such as the Mega-Tech Blade Cutting Plunger for application at a robotic system at Savannah River
- Shared purchase of equipment/services, such as the New Millennium characterization system for concrete at Mound and Ashtabula
- Support to transfer equipment between DOE sites, such as shipment of a Tritium Capture cart from Mound to Los Alamos

Cost savings estimates for DOE are still being compiled, but current data supports a total estimated savings of $3,955,000 from a total equipment cost of $291,490. This provides DOE an overall return on investment of 13.6 to one. This information supports the large returns possible with innovative technology in DOE from the Model B LSDDP.

Current Reporting Period Activities: Hammer drills were purchased for deployment at Mound and Ashtabula. The vial shredder was received and the Mega-Tech system was delivered.

For more information:

http://www-emtd.lanl.gov/LSDDPB/TSTA.html

Tech ID 3148

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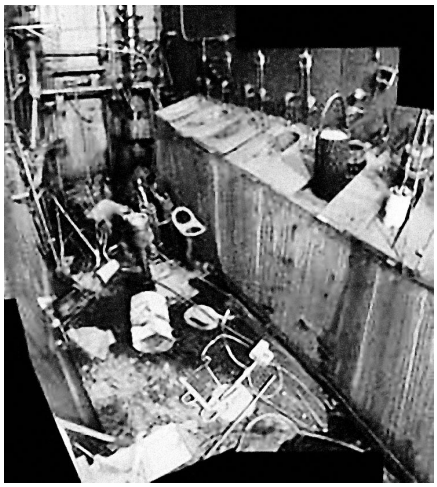
West Valley Demonstration Project (WVDP) Hot Cell D&D LSDDP

Objective and Scope: The objective of the WVDP Hot Cell D&D LSDDP is to demonstrate and deploy new and innovative technologies applicable to the decontamination and decommissioning of DOE surplus facilities, particularly hot cells. These technologies will have the potential to reduce



WVDP Hot Cell LSDDP

costs, shorten schedules, and enhance safety across the DOE complex.

The WVDP, located in western New York, is a former commercial nuclear fuel processing facility that recovered uranium and plutonium from spent nuclear fuel. Two primary facilities have been selected for demonstration sites at the WVDP because of their ongoing and planned D&D activities. The Head End Cells, which contain significant amounts of highly radioactive debris and laboratory equipment, and the Extraction Cells, which contain solvent contaminated process vessels, tanks and piping. Demonstrations will also be targeted in the Fuel Storage Area. Non-host site demonstration or deployment opportunities will also be sought at the Battelle Columbus West Jefferson site and at Hanford's 324 and 327 Hot Cell facilities. Both sites possess needs similar to the WVDP hot cells. DDFA funding for the LSDDP is projected at $4.3 million over three years.

Status, Accomplishments, and Current Reporting Period Activities:

The Integrated Contractor Team continues to review information received from vendors on a range of technologies with remote capabilities, and on a camera that can operate remotely using infrared signals. Detailed information on a self-cleaning filtration unit that has the potential to efficiently capture particulate generated during size-reduction was received from the vendor and used to prepare purchasing documentation needed to demonstrate this technology at West Valley. Information describing a ground-penetrating radar unit capable of detecting pipe in shield walls also was received from a vendor and is being used to prepare purchasing documentation to support demonstration of this technology at the West Valley site in September 2002.

In late September, a scaled enclosure was fabricated and testing began on the fogging system. Initial tests focused on the effectiveness of the fixative to coat equipment and debris such that airborne contamination is reduced. In addition, the fixative was evaluated for its effect on the ventilation and HEPA filtration system. Workers have begun entering the General Purpose Cell, the Mechanical cell, and other cells to begin characterization and sample collection in preparation for hot demonstrations in early FY03. Near-term demonstrations at West Valley in addition to the fogging system and the concrete-embedded component (pipe) characterization system include Environmental Alternatives, Inc. chemical decontamination and an electrochemical decontamination.

For more information:

http://www.wv.doe.gov/lsddp/

Tech ID 3149

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▼RFETS D&D Initiative and Associated ASTD Projects

Objective and Scope: RFETS is on an aggressive, accelerated schedule to achieve cleanup and closure by the end of 2006. The baseline plan for the Rocky Flats Closure Project involves dispositioning over 900 contaminated gloveboxes, more than 450 production process tanks, thousands of feet of ventilation system piping, and miles of production process piping. In order to accomplish this challenging goal, RFETS has incorporated into their baseline plan application of new and innovative technologies for characterization, decontamination, size reduction, and waste handling and packaging.

A significant cost in the D&D of buildings at RFETS is the size reduction and packaging of plutonium-contaminated gloveboxes,tanks, and other equipment. DDFA is supporting the disposition of these systems through the Rocky Flats D&D Initiative (RFI) and associated ASTD projects with status given by the following task titles:

- Enhanced Cutting Tools
- Remote In Situ Size Reduction of Plutonium Contaminated Gloveboxes and Equipment
- Decontamination of Gloveboxes, Tanks and Equipment For Shipment and Disposal without Size Reduction
- Demolition of Contaminated Buildings
- Characterization Disposition of Contaminated Buried Equipment
- Beryllium Monitoring and Characterization
- Upgrade Radiation Instruments
- Upgrade Existing Fire Alarm System
- Data Management System

All of these projects seek to identify and deploy proven, commercially available technologies and innovative systems that require only minimal modifications for the safe and cost-effective disposition of contaminated processing equipment and systems. The RFI serves to augment the ASTDs and to support problem-specific deployments not currently funded by an ASTD project, such as the characterization and eventual removal of concrete-embedded equipment in Building 776.

Status, Accomplishments, and Current Reporting Period Activities:

Enhanced Cutting Tools: Rocky Flats has initiated work to procure and fabricate improved manual/remote containment systems and cutting equipment for size reduction of plutonium-contaminated gloveboxes, ducts, and equipment. This element has funded deployment of improved containment systems such as the Inner Tent Chambers (ITC) in Buildings 771 and 776. ITCs allow remote size reduction of gloveboxes and tanks by operators standing outside a containment structure. In FY02, this element also includes evaluation, testing, and deployment of enhanced duct cutting tools.

Status

- **Chipless Pipe Cutters—**

Prototype duct cutting tools from three vendors were successfully demonstrated on 14-inch diameter, Schedule 10, stainless steel pipe in the third quarter of FY02. Tool weight, ease of tool setup, radial clearance and ability of the tool to minimize pipe distortion during cutting were key evaluation criteria. A cutter provided by Black Diamond Services was further field-tested by D&D personnel in the fourth quarter in B771. The cutter performed as advertised but was rejected for further use on Zone 1 piping. Reasons cited were tool weight (~100 pounds) that made handling difficult and potentially dangerous in congested areas of overhead piping, and the presence of numerous surface features that acted as contamination traps. This technology will not be pursued further for Zone 1 ducting. The split ring cutter was judged not to be a significant improvement over the current baseline method of manual cutting with hydraulic nibblers.

- **Abrasive Water Jet Cutting—**

The system is a portable, remotely operated cutting system, for tanks larger than five feet in diameter. The unit employs a high-pressure stream of water containing a garnet abrasive. A cutting head is remotely driven along a flexible track that is clamped around the tank. A cutting rate of 20 inches per minute is expected on 3/8-inch steel at one gallon per minute at a pressure of 55,000 pounds per square inch. Compared to the use of nibblers, remote water jet cutting is faster, eliminates the risk of worker injury from punctures and lacerations, and poses fewer ergonomic issues. Water jet eliminates the fire and ventilation issues associated of plasma arc cutting. Jet Edge representatives set up and demonstrated the equipment and trained D&D personnel. A Jet Edge system was successfully deployed in B774 to size-reduce a 6-foot diameter by 27-foot long stainless steel tank at a typical cutting rate of 24 inches per minute. This project deployment is complete. Further use of the system is planned for size reduction of either the Zone 1 filter plenums in Building 771 or four additional tanks in Building 774.

- **Overhead Component Removal and Scabbling—**

This initiative is to demonstrate the feasibility of using explosive tape for removing overhead lines and equipment and removing contaminated surfaces from concrete walls, floors, or ceilings. This technique has advantages over traditional baseline methods requiring extensive scaffolding construction, manual in situ size reduction, and rigging

of individual cut sections. Use of explosive tape to remove overhead pipe and ducting was successfully demonstrated in Building 125 in September on three sections of pipe and duct. Removal was accomplished by simultaneous detonation of pipe hangers on each section. Spread of a surrogate contamination tracer was minimal. Approximately 120 feet of pipe and duct were removed. A demonstration of the use of explosive tape for scabbling of concrete walls is planned for the first quarter of FY03.

Remote In Situ Size Reduction of Plutonium Contaminated Gloveboxes and Equipment:

This task supports design, procurement and fabrication of remotely operated systems capable of size reducing and packaging gloveboxes and equipment which must be decommissioned in place (in situ). The only current activity under this task is the Building 771 in situ system for large gloveboxes. This task is complete.

Decontamination of Gloveboxes, Tanks and Equipment for Shipment and Disposal without Size Reduction: This task supports the deployment of improved decontamination, instrumentation, and fixative technologies to allow shipping and disposal of plutonium-contaminated gloveboxes and equipment as low-level waste without the need for size reduction.

Several efforts are underway to provide systems for improving the ability to ship equipment as Surface Contaminated Objects (SCO).

Status

- **Decontamination of Ducts and Chainveyor Lines—**

This system is composed of a portable glovebox equipped with a suite of conventional decontamination tools (spray nozzles for cerium nitrate, vacuum system, swabs, etc.) that will be sleeved to the end of eight 16 foot long sections of chainveyor lines that have been separated and lowered to the floor for decon operations. Scarcity of gloveports in typical chainveyor lines precludes the use of more traditional spray and wipe methods for decontamination. Fabrication and delivery of the system is expected to be complete by mid October 2002.

- **Structural Foam for Disposal of Lead-Lined Gloveboxes—**

This is a project to deploy a system for foaming the interior of lead-lined gloveboxes to meet Envirocare's "no void" requirement for disposal of low-level gloveboxes with lead. Currently, lead shielding and lead-containing windows and gloves must be removed and disposed of in a separate waste stream. The scope of this project is to collaborate with Envirocare to identify the properties of an acceptable foam, obtain DOT approval to ship foamed gloveboxes, and to demonstrate/deploy a foaming system at RFETS. Foaming will replace the current baseline technology that consists of manually removing lead and lead-containing components prior to shipment. The proposed technology will eliminate the cost and worker risk associated with manual removal of all lead from gloveboxes before disposal. In the fourth quarter, equipment was successfully deployed in B371 and used to foam the first glovebox destined for shipment to Envirocare with lead intact. Shipment is expected by the end of October.

- **Large Area Detector and Pole-Mounted Carriers—**

The scope of this project is to develop and deploy pole-mounted Electra Probes and floor/wall/ceiling carriers for Electra probes to facilitate radiological characterization of large areas of building structures. RISS has received the floor/wall carrier and pole units from TMR and the floor carrier and pole units from SA Robotics. Delivery of the SA Robotics wall/ceiling carrier unit has been delayed until mid October. Field-testing of available equipment is continuing as scan locations become available.

- **Electra Plus/AP-6 Instrumentation Display Integration—**

This project is a follow-on to the large-area detector task described previously. The technology will integrate the displays from the three Electra Plus/AP-6 instruments into a single display mounted on the large area detector survey cart. The integrated display will include "power" bars, easy-to-read digital displays in dpm/100 cm2 and cpm/probe area, and audible alarms for each instrument and for the average of the three instruments. This single display will increase the efficiency of surveys and decontamination

efforts by enabling the operator of the large-area detector cart to identify and mark, in real time, any areas in need of additional decontamination. Conceptual design of the application package is underway. Hardware and software delivery is expected by mid October.

- **In situ Decontamination of Underground Process Waste Lines—**

The scope of this task is to deploy proven sewer system cleaning technology to process waste lines. Jetting of underground pipes flushes contaminants into a collection tank for later treatment. Additional water is pumped through jetted pipes, sampled, and analyzed. Equipment has been procured, the 400 Area valve vaults have been blown down and sampled, and jetting and rinsing of the first process lines are complete. Analysis of rinsate shows pipes to be RCRA clean. Approximately 600 feet of contaminated piping from the 400 Area was successfully jetted and flushed. Due to the success of Phase 1 testing, jetting of additional underground piping in the 400 Area is continuing. A request for additional OST funding for jetting and analysis of more highly contaminated piping is expected.

- **Bio Remediation of an Oil/Water Trench in B776—**

Equipment and Ecosolve media were previously deployed in Room 150, Building 776. Bacteria were added to the trench in June and have effectively reduced a one-inch oil layer to a thin film. A bottom layer of caked sludge took significantly longer to degrade. Monitoring of bacterial activity was curtailed in September. A final report will be issued in October 2000.

- **Remote Sampling and Characterization (Millennium) System—**

The scope for remote sampling and characterization has been redirected from the Building 771 Closure Project to the Building 776/777 Closure Project. There is no status change from last quarter. Deployment of this sampling and characterization technology is on hold pending the results of the Building 776/777 containment evaluation.

- **Soft-Side Overpacks in Lieu of Strong Tight Containers—**

This initiative is to qualify the use of DC-2 polypropylene/polyethylene overpacks in place of standard IP-1 containers for very large equipment and non-DOT certifiable waste containers. Currently, structurally deficient contaminated cargo containers and contaminated equipment larger than 8 feet square and longer than 18 feet must be size reduced to fit standard DOT approved IP-1 containers. Ability to use softsided overpacks eliminates the need for time consuming and dangerous size-reduction requirements for very large low-level waste items. In the last quarter, four certified IP-1 containers were shipped in overpacks to NTS to demonstrate compliance with DOT requirements.

- **Use of Polyurea Coating as an IP2 Container—**

This project will demonstrate the feasibility of using a spray-on polyurea coating for shipment of large, low-level (100 nCi/gm. maximum) waste items to the Nevada Test Site in place of standard IP2 waste containers. The process consists of wrapping the intended waste item in a shrink-wrapped plastic film followed by application of the polyurea spray coating. The coating has excellent mechanical properties, is impervious to water, resistant to most chemical environments, and thermally stable up to 350 degrees F. Use of this coating is already approved for large, low-level waste items containing less than 10nCi/gm. Ability to use the polyurea custom package eliminates the need for time consuming and dangerous size-reduction requirements for packing very large low level waste items in standard DOT approved IP2s. Fourth quarter efforts have focused on defining the scope and deliverables for an engineering study to identify the parameters within which the polyurea coating will meet DOT requirements for IP2 containers. The Colorado School of Mines is expected to perform this analysis.

- **Passive Aerosol Generator for Fogging Large Rooms—**

This project is complete. The scope of this project was to demonstrate the effectiveness of a specific passive aerosol generator in reducing the Derived Air Concentration (DAC) in very large rooms. The generator used is tunable to optimize droplet size for maximum dispersion and coverage. Reducing DAC levels sufficiently may reduce required respiratory protection requirements or, in the case where supplied air is still

required, may increase worker stay times. Additionally, passive aerosol devices preclude the need for personnel to enter high DAC areas to apply fixatives with active spraying systems. In this quarter, a passive aerosol system was procured and successfully demonstrated in the Building 776 Advanced Size Reduction Facility and the Size Reduction Vault. DAC levels were significantly reduced allowing initial entry with Powered Air Purifying Respirators (PAPR). Further application of this technology on site is planned.

Demolition of Contaminated Building:

Initially, the scope of this task was to define the criteria, conceptual approach, and initial engineering for the demolition of a contaminated building. The initial strategy was based upon construction of an external building containment (tent) for contamination control. Plans to complete the engineering design, procurement, and construction of a containment system for Building 776, however, have been put on hold as a result of the recommendations of an OST-sponsored Technical Assistance Team (TAT). A position paper is now being developed to provide a sampling and remediation plan that will support building demolition potentially without containment. In parallel, DOE is being appraised of this strategy. It is expected that the remediation plan will now be approved by late October 2002. No further work will be expended on a containment evaluation until the current plan to demolish B776/7 potentially without containment has been through DOE review and public comment period. No further work will be expended on a containment evaluation until demolition without a tent is evaluated.

Characterization and Disposition of Contaminated Buried Equipment:

This task is to define and characterize areas that contain buried equipment below the floor in Building 776. Removal and packaging of the buried equipment is expected to take place in FY2003 and FY2004.

Status

- **Building 776 Equipment Characterization—**

Procurement of a gravel vacuum system from Vac N Ship has been authorized. Commonly used in commercial applications, this system will allow removal of gravel surrounding buried equipment to avoid the need for manual removal by D&D personnel working in a confined space.

Beryllium Monitoring and Characterization:

This task is to develop and deploy beryllium instruments to provide real-time air monitoring and to provide in-building reading of swipes and filters.

Status

- **Beryllium Air Monitor—**

A performance-based contract was awarded to Amzil, Inc. for fabrication of a beryllium air monitor. Measurements of blind standards prepared at Rocky Flats initially indicated that the technology could detect Be to the required level of 0.1 ug/m3. Continued vendor testing showed that this lower detection level could not be achieved reliably. System improvements have since achieved a repeatable detection capability of 0.2 ug/m3 but spectrometer problems and integration of new algorithms continue to impede further improvements. Work at Amzil is continuing. On-site instrument validation will begin after receipt.

- **Beryllium Swipe Monitor—**

Contract award and fabrication of the unit have been delayed until early FY03 pending acceptance of the Beryllium Air Monitor.

- **Direct Reading of Beryllium Swipes—**

A contract was awarded to Los Alamos National Laboratories (LANL) for the development and deployment of a real-time beryllium surface monitoring technique using surface swipes and colorimetry for detection. When acid is applied to beryllium-contaminated swipes that have been pretreated with a colorimetric reagent, beryllium species are solubilized and the solution turns a characteristic color. Laboratory tests showed the technique to be sensitive to concentrations above 0.2 micrograms per 100 cm2. Field-testing to validate the technique showed that the presence of contaminant metals resulted in an unacceptable percentage of false positive tests. No further testing is expected under the current approved authorization. Completion of the Phase I report is now scheduled for the first quarter of FY03.

Upgrade Radiological Instrumentation:

This task supports the deployment of instrumentation and data collection systems supporting Site closure. This deployment will provide the latest systems for compliance with radiation control, release limits, and control/tracking of waste.

Status

- **External Gamma Measurement for SCO Characterization—**

This is a project to develop a gamma measurement system and a technical basis for externally measuring the internal surface contamination of ducts, gloveboxes, and tanks. Laboratory and field tests have shown that quantifying internal contamination in the SCO range is feasible for ducts and tanks using a NaI detector. Quantifying contamination in gloveboxes is not practical due to non-uniformity of both shape and contamination levels. The technical basis document and procedures for calibrating and operating the system are complete. This project is complete and the system is available for use.

- **Alpha Detector for Measurement of Contamination Inside Pipes—**

An initiative was recently approved to develop an instrument to field characterize the level of contamination in pipe and conduit. System will be based on a 0.5-inch diameter, side-looking GM counter. The ability to appropriately characterize SCO pipe during stripout will avoid current baseline practice of conservatively characterizing all pipe as TRU waste. Once characterized as TRU waste, pipe must be subjected to a dditional costly size reduction and package counting steps. Ludlum has modified one detector and laboratory testing is underway.

- **Ludlum 195 High-Range Alpha Ion Probe—**

This is a project to develop the Ludlum 195 alpha measurement device to replace the Ludlum 12-1A. Used extensively on D&D projects, the Model 12-1A is a low-cost device commonly used for contamination measurements of the interior of gloveboxes prior to disposal and then discarded. Ludlum has discontinued manufacture of this unit. The scope of this project is to replace the obsolete 12-1A with an accurate, low-cost unit (Model 195) equipped with an expendable probe that can be field-replaced without system recalibration.

Neutron Gram Estimator:

An initiative is approved to qualify a BNFL neutron assay instrument for use as a near real-time small waste package counter. All waste packages removed from Pu-containing gloveboxes must be gram counted before placement in a waste container. In the field, measurements of fissile material are currently made by a highly trained crew using gamma measurement instruments. Measurements are then analyzed and a report of estimated grams is provided. Individual packages must be staged until a data are taken and analyzed. The BNFL system will allow gram estimates to be generated in minutes, instead of hours, by D&D technicians. The qualification plan is approved and characterization of both the TRU-D instrument and the waste matrix effects on measurement variability are complete. Qualification testing is in progress.

Upgrade Existing Fire Alarm System: This task supports the deployment of a System 64 wireless fire alarm technology to transmit alarms over radio frequency. The system replaces the existing hardwired system.

Status

- **Wireless Radio Frequency Emergency Warning System—**

This project is complete. Installation of the Radio Frequency Alarm Network, and programming of the network to interface with the Site system, was completed last quarter. During this quarter, the B881 system installation and testing were completed. Installation included 21 pull stations, 13 repeaters, and 3 flow switches in the building. Follow-up implementation in other facilities is underway.

Database Management System:

This task supports the development and deployment of a database management system designed to manage radiological and non-radiological survey data. Data is downloaded directly from survey instruments and laboratory databases where complex Multi-agency Radiation Survey and Site Investigation Manual (MARSSIM) and other release calculations are performed quickly and accurately.

Status

- **Facility Characterization Database—**

Database has been developed and internally tested. Initial user review and training are completed. User-initiated refinements to

the system have delayed completion of verification and validation until early November.

For more information:

Tech ID 2918

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Mound Facilities Long-Term Stewardship (LTS) Initiative

Objective and Scope: The Mound LTS Initiative is designed to identify, select, demonstrate, and deploy technologies and systems that will provide DOE, regulators, stakeholders, and the public with the assurance that the public and the environment are protected from harm after cleanup of the Mound site is completed in FY2006. This initiative is intended to serve as the prototype for LTS of all DOE buildings and equipment. It will serve as a test bed for a suite of real-time integrated surveillance and monitoring systems, which will function autonomously to transmit data to remote locations.

Status, Accomplishments, and Current Reporting Period Activities: With the change in the organizational structure of EM's Office and Science Technology, this Mound project has been shifted from DDFA to headquarters under Thrust Area 1—Support to Closure Sites, with an indefinite continuation period. Headquarters' initial objective was to expand the focus of this project to include LTS 'issues' related to soils and groundwater.

For more information:

Tech ID 3128

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Integrated Excavation Control System (IECS) ASTD

Objective and Scope: This ASTD involves a partnership between Fernald Environmental Management Project (FEMP), DOE-EML (Environmental Measurements Laboratory), Argonne National Laboratory and Idaho National Environmental and Engineering Laboratory (INEEL) to procure and deploy an excavator equipped with real-time sensors (sodium iodide or hyper pure germanium detector) for precision excavation of above-Waste Acceptance Criteria (WAC) materials and real-time pre-certification surveys in complex terrain. The IECS will address real needs at Fernald and other sites that require the complex excavation of radionuclide-contaminated soils during the below-grade D&D of large structures.

Status and Accomplishments: The excavator mounted measurement device (Excavation Monitoring System) was deployed in May 2002 in Area 2, Phase II to radiologically scan a hillside to identify the boundary of radium-226 contamination. The EMS will be deployed in July 2002 to the former production area to scan a trench that was excavated. The scanning of the trench for gamma emitting radionuclides will be to ensure that no uranium was present after the excavation at concentrations which exceed the On-Site Disposal Facility's waste acceptance criteria.

Current Reporting Period Activities: Use of the Excavation Monitoring System (EMS) for above-WAC (waste acceptance criteria) scans has been approved by the regulatory agencies and excavation work has been taking place in Area 3A/4A since May 2002. Deployment of IECS in Area 3A (former Fernald Production Area) was completed. The EMS was used for one project within the production area and one project outside the production area. In the production area, the EMS was used to scan pipe trenches around the Plant 5 foundation in Area 4A. It was also used to scan a trench near the K-65 silos, which is outside of the production area.

With the exception of components and materials needed to construct a cradle to transport and store the EMS, all major equipment acquisitions are complete.

INEEL has submitted a conceptual design drawing of a transport and storage stand for the EMS and for a cover to protect EMS instrument mast from the weather during periods when the equipment remains idle in the field.

Major accomplishments this period include:

- First field deployment of EMS in Area 2/Phase 2.
- First deployment of EMS to scan a deep trench in the former production area of FEMP.

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Tech ID 3180

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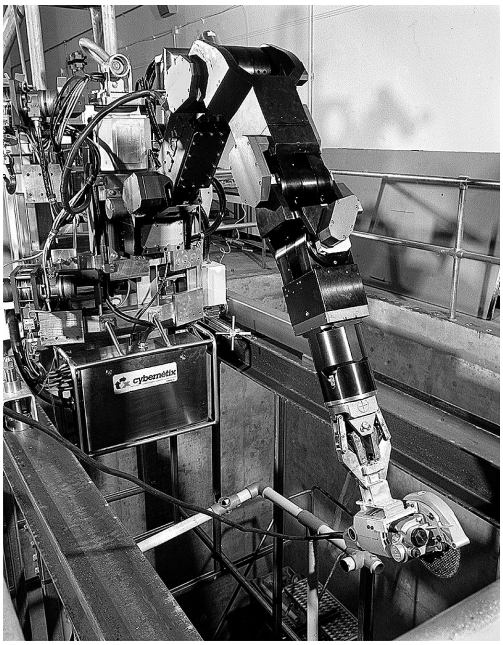
▼Remote Size Reduction for Large Hot Cell Deactivation ASTD

Objective and Scope: The 324 Building, located at the Hanford Site near Richland, Washington, is being deactivated to meet state and federal cleanup commitments. The 324 Building has several highly radioactive tanks, tank vaults, piping, and large hot cells containing complex chemical processing equipment. To meet the cleanup commitments, there is a need to deploy more rapid and remote size-reduction, debris collection and removal, characterization, and decontamination methods. Readily deployable deactivation methods that reduce worker exposure, secondary waste generation, costs, and risks are also needed. Deployment of a remote/robot work platform in the 324 Pipe Trench with full reach capabilities will significantly accelerate work tasks, eliminate the need for multiple, specialized tool design and procurement, and reduce the overall program risks.

The Hanford Site ASTD project will fund the deployment of a robot work platform to support deactivation of the 324 Building Pipe Trench. Through this project, Hanford will procure and deploy a remote/robot work platform that is positioned with an overhead crane to perform a variety of deactivation activities. Following the Pipe Trench cleanup, the work platform will be deployable for other 324 and Hanford site cleanup missions.



Hanford Site: Cybernetix Robotic Work Platform in the 306-E Building Pipe Trench Mockup:

Status and Accomplishments: The original contract with Cybernetix was modified to include fabrication of a special support structure to allow the robotic work platform to be placed in the 324 Building's Airlock Pipe Trench. All contracted equipment was received in March 2001. The robotic system was then set-up in Hanford's 306-E Building to perform Site Acceptance Testing, receive initial training from the vendor, perform detailed training with facility operations and maintenance staff, and perform a broad suite of deactivation tasks in the mock-up of the Pipe Trench. In late September 2001, the robotic system was transferred from the 306-E Building to begin its deployment in the 324 Building's Airlock Pipe Trench. The Cybernetix system recently completed its first deployment in the Pipe Trench. The system supported cutting, removal, and handling of piping, removal of drip pans, and other highly contaminated debris. On January 10, 2002, the waste from the Pipe Trench's - Phase 1 cleanout effort was transported to Hanford's 200 Area for storage. Due to its robust design, the robotic system is targeted for use on a variety of deactivation tasks in the 324 Building over the next 4-5 years.

Current Reporting Period Activities: Minimal activity has taken place with the Cybernetix system during this past quarter. The 324 Building Deactivation Project is fully engaged in the removal of spent fuel from B-Cell, and will continue in this mode through the second half of CY02. Upon completion of this effort (targeted completion by December 20, 2002), the Cybernetix

system will support follow-on deployments in B-Cell and other hot cell areas (i.e., the Shielded Material Facility) in the 324 Building.

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LANL Decontamination and Volume Reduction System (DVRS) ASTD

Objective and Scope: LANL currently has more than 2,400 cubic meters of oversized metallic TRU waste in storage. This waste is non-certifiable for shipment to the Waste Isolation Pilot Plant (WIPP) in its present packaging configuration. In addition, another 3,000 cubic meters of similar waste from on-site D&D activities and site upgrades are at various locations at LANL. To meet cleanup commitments, there is a need to deploy a system for decontaminating and volume-reducing this waste that is less costly, less labor intensive, and quicker than the baseline method of processing the waste entirely by hand. The disposal of oversized metallic TRU waste is a problem at many DOE sites.

The DVRS process will reduce the volume of oversized metallic TRU waste using an integrated system of technology and equipment for assaying, confinement, decontamination, and volume reduction. The project includes a 13,200-square-foot outer building along with a 2,500-square-foot contamination-control structure nested inside. Both structures have active ventilation and contamination control; a multi-station passive-active, neutron non-destructive analysis system; several fixed and portable processes for decontamination of metal objects; and a large dedicated system to shear and crush large metallic objects for placement in 55-gallon drums.

Status and Accomplishments: Both the outer building and contamination control structure are complete. The facility has been engaged in process performance testing/optimization, expanding procedures for flexibility, training effectiveness, and system reliability centered maintenance. These operations are being done to prepare the facility for expanded operations.

This project is now complete. The system has been taken over by the end user and has begun processing materials.

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Tech ID 2242

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Oversize TRU Waste Laser Cutting System ASTD

Objective and Scope: DOE-Nevada has a need to size-reduce and characterize 58 oversized TRU-contaminated metal boxes with a total volume of 270 cubic meters prior to shipping them to the WIPP. The contents of these boxes are 32 contaminated gloveboxes, a metal cutting lathe, lengths of metal piping, lengths of angle iron, and various scrap metals. The Hanford material requiring size reduction includes a minimum of 150 gloveboxes, as well as ductwork and piping. At Rocky Flats Environmental Technology Site (RFETS), the laser cutting system will also be applied to 150 contaminated gloveboxes.

Status, Accomplishments, and Current Reporting Period Activities:

TOWRS Procurement

All equipment has been procured, and LANL is shipping it to TRUTech.

Pre-operational Testing

Pre-operational testing will probably take

place at TRUTech as part of a training and project development or demonstration activity. Training and project development is included in the CRADA. As noted in previous reports, Fluor Hanford (FH) has supplied a tank and a glovebox to the project for training and testing purposes

Deployment

The CRADA between LANL and TRUTech has been signed. This satisfies HQ and NV milestones. The CRADA consists of a 24-month period for TRUTech to market TOWRS to perform deactivation and decommissioning work for nuclear and non-nuclear applications. This includes development of a commercialization plan, training and customer development, and identification of deployment opportunities. As part of the CRADA, LANL will supply up to 100 hours of consulting and engineering support.

FH is preparing a white paper describing how TOWRS could be deployed at the Plutonium Finishing Plant at Hanford. This will be the last major FH activity on the project. The paper will be of great usefulness to TRUTech in its marketing efforts.

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▼Intrusive and Non-Intrusive Characterization through Concrete Walls and Floors ASTD

Objective and Scope: In mid-FY2000, the MEMP was awarded an ASTD project to ascertain the nature and extent of contamination in an area under SW Building known as the "Old Cave." The Old Cave is actually the entombed remains of a 1950's hot cell, which must be removed before the City of Miamisburg, Ohio, will accept ownership of the Mound Site. In SW Building, the Old Cave is located under an area designated SW-19. Because of lack of knowledge of what is in the Old Cave area, ultra-conservative estimates of the amounts of actinium-227 and radium-226 have been made that required the Old Cave to be classified as a Category 2 Nuclear Facility. It is considered highly unlikely that much radioactive material resides in the Old Cave. The approach is to characterize SW-19, the surroundings, and the entombment. In Phase I - Non-Invasive Investigations the entombment will be characterized using ground-penetrating radar and time-domain electromagnetic gamma spectrometry, drain exploration, and radon monitoring. In Phase II - Invasive Investigations, these investigations will be performed with respect to the entombment via diamond core drilling and/or geoprobe with a real-time position location determination device. Once radioactivity levels are determined and a final design decision to the Baseline Plan is made, several enhancements that shorten the schedule and reduce costs may result. A baseline recovery of only one week would recoup the entire ASTD investment. If the baseline acceleration is greater than the one week, the return on investment will increase proportionally as additional weeks/months are saved from the baseline. Based on the Value Engineering Study, it is conservatively estimated that four months can easily be recovered when compared to the present technical approach.

Status, Accomplishments, and Current Reporting Period Activities:

No activity to report.

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Demonstration and Deployment of Remotely Operated Size Reduction System (ROSRS) ASTD

Objective and Scope: The Savannah River Site (SRS) has identified over 600,000 cubic feet of radiologically contaminated large equipment (CLE) requiring disposition. This represents a much larger quantity than anticipated. DOE Order 435.1 will elevate regulatory attention and surveillance impacts for this stored material. The cost will increase significantly for deferring permanent disposition. Disposal of this material in its current condition would consume the SRS waste disposal capacity, be cost prohibitive, and waste DOE assets.

SRS originally proposed to procure a suite of four systems to augment existing infrastructure and facilitate size reduction and decontamination of CLE. The proposal was submitted and approved as an ASTD, titled Disposition of Contaminated Large Equipment. The original funding amount was $500,000.

The ROSRS was originally intended for deployment at RFETS, also as an ASTD. An alternate system was subsequently deployed. The ROSRS was combined with the SRS CLE project to form a new SRS ASTD, titled Demonstration and Deployment of ROSRS. The Scope of Work (SOW) was subsequently completely changed and rewritten. The scope now includes the installation, shakedown, and demonstration of the ROSRS at SRS in FY2002.

The approach proposed above capitalizes on the remotely operated technologies and equipment to minimize health and environmental risks, as well as to accelerate cleanup and reduce costs while meeting project objectives. The ROSRS will be used in conjunction with the SRS Decontamination Facility to provide capabilities for disposition of large equipment and to support ongoing routine decontamination work.

Status, Accomplishments, and Current Reporting Period Activities: The deployment activities for the Remote Operated Size Reduction System (ROSRS) have been placed on hold until the end of the first quarter of fiscal year 2003. The delays are a result of uncertainties associated with the use of the system. SRS is current negotiating with Oceaneering to formalize the deployment schedule and implementation requirements for the ROSRS. The system will be constructed in the C Reactor Building for test demonstration purposes so that the system can be properly evaluated for future use and eliminate the long-term storage of the system, which would lead to deterioration of the equipment. The project still offers the Site a significant amount of cost savings and schedule acceleration.

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Deployment of Improved Technologies for Cleanout of the F-Reactor Fuel Storage Basin ASTD

Objective and Scope: Cleanout of the F-Reactor Fuel Storage Basin (FSB) is a key step in completing the Paths to Closure for the Hanford Site. The F-Reactor FSB has complex technical issues and unique challenges, including the identification, removal, and disposal of miscellaneous contaminated debris, which is potentially interspersed with pieces of spent fuel elements buried under 6.1 meters (20 feet) of sandy soil. The technical needs associated with the project include characterization, backfill removal and segregation, and material removal and segregation.

Historical data and preliminary characterization information indicate that the top 5.2 meters (17 feet) of fill should be free of radiological or chemical contamination and that most of the debris is expected to be found primarily in the lower 15 percent of the basin.

Status, Accomplishments, and Current Reporting Period Activities: No activity reported.

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▼Pollution Prevention in D&D Activities at INEEL ASTD

Objective and Scope: This Accelerated Site Technology Deployment Project (ASTD) will accelerate schedules, reduce costs, and minimize pollution through technology deployments in the areas of facility characterization, sludge treatment, dust and contamination control, and concrete demolition. Specifically, this project will deploy the following commercially available technologies in D&D projects:

- Russian Gamma Locator Device (GLD) and Isotopic Identification Device (IID) for remote characterization
- LEADX® sludge stabilization technology for immobilization of heavy metals
- Passive aerosol fogging for control of dust-borne contamination
- SureStrike Rock Breaker (Hammerhead) for concrete demolition
- Initial and secondary deployments of each of the technologies will be conducted at INEEL facilities

Status, Accomplishments, and Current Reporting Period Activities:

Sludge Treatment—

It was determined that a treatability study was not required, as the sludge is not yet considered waste. A sampling plan and procedure was completed to obtain CPP-603 sludge samples. Samples of pool sludge taken from a water treatment tank (SFE-106) were treated with LEADX® and TCLP analysis completed. Results were inconclusive. Sampling directly from the CPP-603 pools was delayed due to the unavailability of operators (all on higher priority projects) to obtain the samples.

GLD/IID—

A contract was placed with Redzone to conduct a commercialization study. This contract included the following tasks:

Task 1—Comparison of Competing Technologies

Task 2—Market Study

Task 3—Technology Development and Enhancement

Task 4—Technology Deployment and Commercialization

Redzone completed:

Task 1—Technology Comparison Report in August 2002 and

Task 2—Market Study in September 2002. Redzone representatives traveled to Russia on September 16-27, 2002 to discuss marketing and technical issues.

Task 3—Development Requirements and

Task 4—Deployment Plan/Final Report will be completed in October 2002 as long as funding committed to this task is available.

Fogging—

Encapsulation Technologies personnel fogged the ducting in the CFA-617 laundry facility on May 14, 2002. When the ducting was opened, a large amount of lint was found instead of the small coating of dust/lint expected. No respirators were required during disassembly because the contamination level was found to be very low. When the operators touched the lint, they found it was very flocculant and easily rubbed off. The operators were expecting the lint to be better adhered to the surface; however, fogging is not the correct technology to "fix" this large amount of dust and lint (strippable or fixative coatings would be better). Fogging is intended to adhere the contamination floating in the air to surfaces (i.e. small particles). A discussion on fogging was held with D&D operators with a path forward for INEEL on the technology addressed.

Excessive Lint in the CFA-617 ducting prevented the fogging from making a difference.

A second fogging deployment is planned for October 2002 in the fuel cutting cave at CPP-603 and a purchase requisition for a fogger has been completed. As long as the funding committed to these contracts is available, INEEL will complete a second deployment and have equipment available for follow-on deployments.

Hammerhead—

INEEL D&D Operations deployed the Hammerhead at Test Area North (TAN) on June 25, 2002. The test was performed on the TAN-615 concrete pad area. The Hammerhead Breaker was attached to the Case 680L Backhoe in 15 minutes. The Equipment Operator (E.O.) moved the Hammerhead around for about three minutes to get familiar with the Hammerhead. Next, The E.O. began using the Hammerhead on the five-inch thick concrete pad. Although no major damage was noted from the Hammerhead impact area on the surface of the concrete, the concrete was rubblized underneath, as was expected. Hammerhead was effective on breaking up the concrete while creating little or no dust. The Radiological Control Technician was pleased with the lack of dust generated by the concrete breaker and stated that it would be very useful in radiological contaminated areas.

The Hammerhead Breaker was deployed three additional times at the TAN-615 facility area in July 2002 on the sump. The hammerhead was used to break concrete around the sump and the cap on the sump. The hammerhead worked very well on the five-inch concrete (with rebar) around the sump. No dust or rockfly was noticed during the hammerhead operation. The hammerhead could not rubblize the eight-inch concrete cap on the sump. The Equipment Operators stated that the baseline hydraulic concrete breaker could break concrete eight-inch thick with ease, but created dust and rockfly. The Radiological Control Technicians didn't want any dust or rockfly created due to low-level radioactive contamination in the sump. It should be noted that larger Hammerhead equipment that could break the thicker concrete sections is available for purchase. These larger units would also increase the rate of breakage that the operators indicate is slower with the current model than their baseline hydraulic hammer.

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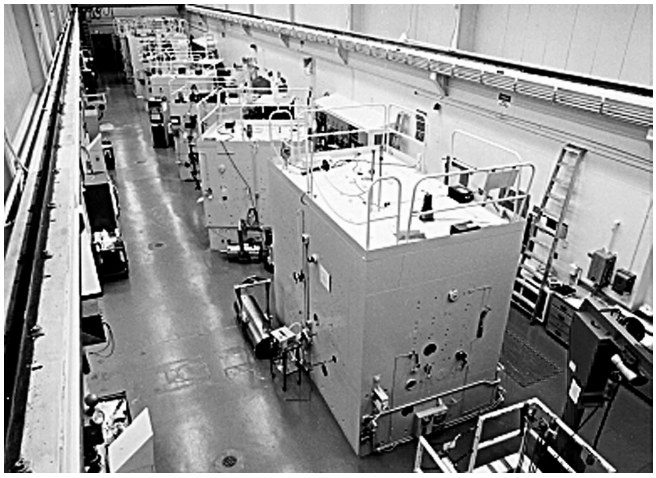
Technologies to Enable Monolithic Disposal of Hanford Hot Cells-ASTD

Objective and Scope: Hanford's 327 Building was previously used as a nuclear research laboratory to examine irradiated fuels and material and to support operations of the site's production facilities. The 327 Building's nine shielded hot cells and their ancillary equipment (HVAC, drains, etc.) are the primary contribution to a significant inventory of radioactive material "hold-up."

This ASTD project supports accelerated deactivation and decommissioning of the 327 Building's large (60-150 tons) hot cells by deploying a selected suite of characterization technologies that will result in a minimized need for decontamination, materials handling, and production of secondary



Hot Cells Located in 327 Building Canyon

waste. By deploying recent advances in non-destructive assay (NDA) techniques and selective use of dry decontamination methods, Fluor Hanford aims to prove that "less than transuranic (TRU)" (i.e., <100 nano-Curies/gram) levels can be achieved on the 327 Building hot cells. Decontamination will be performed only where needed to get below TRU designation levels, and the need for decontamination will be determined following extensive characterization and analysis of the hot cells. Use of these technologies will result in designating these hot cells to allow for cost-effective shipment and disposal.

This project supports DOE's vision for accelerating closure of Hanford facilities and waste sites that are located along the Columbia River corridor.

Status, Accomplishments: Fluor Hanford was authorized by DOE-RL (March 12, 2002) to initiate OST-funded scope and funding expenditure. Contracts for equipment procurement have been awarded, and delivery schedules are consistent with the project milestones submitted in the Technical Task Plan RL02DD51. Fabrication and calibration of the Neutron Detection Instrument Pod is complete.

Current Reporting Period Activities: In addition to the receipt of the characterizations systems noted above, Canberra and PNNL representatives have been on location to set-up and test equipment, train personnel on equipment deployment, and support data collection. Images collected during initial deployment of the CARTOGAM gamma camera are provided below.

The Hot Cell NDA-QA Plan and the Hot Cell Characterization Deployment Plans have also been published. These activities have been accomplished to support the milestone for having all characterizati on equipment ready for deployment by mid-October, and are necessary to meet the data quality requirements necessary for waste designation of the hot cells.

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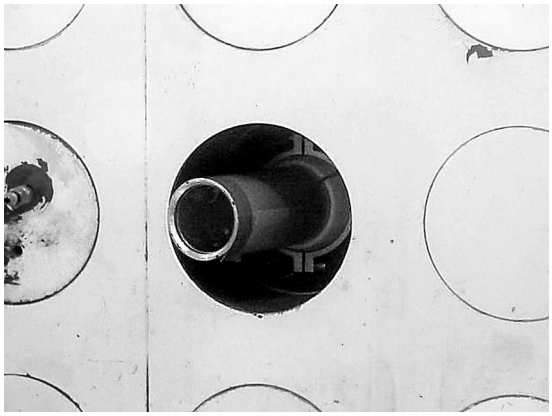
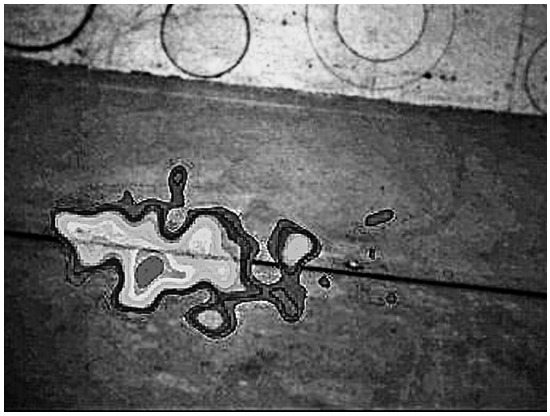
▼Florida International University

Objective and Scope: FIU-HCET is working on several D&D related research projects under a grant awarded by OST. The FY2002 projects include:

- Technology Information Management and Dissemination
- D&D Technology Assessment Program
- Technology Assessment and Evaluation Facilities and Methodology Development

Left—The Cartogam gamma camera inserted through a 327 Building hot cell port to permit "pictures" to be taken of the opposite wall and floor.
Right—The Cartogam gamma camera identifies apparent contamination in and along the floor pan seam of the 327 Building G-Cell





- Tool and Sensor Applied Research and Development
- Tool and Sensor Delivery Platform Research and Development
- Technology Deployment
- Long-term Monitoring and Stewardship for DDFA
- Aerosol Research, Development, and Modeling to Support D&D Operations

Status, Accomplishments, and Current Reporting Period Activities:

Technology Information Management and Dissemination:

The Gateway to Environmental Technology (GET) website was redesigned using the latest Microsoft Visual Studio.Net technology. The new technology overcomes most of the limitations of Classic ASP technology and adds many advanced features for developing Web-based applications, such as improved performance, scalability, security, modular design, and component-based architecture.

D&D Technology Assessment Program:

For FY02, nine technology demonstrations have been completed, and summarized in monthly reports. Technologies evaluated were in the areas of integrated multi-purpose D&D technologies (facility demolition and decontamination) and equipment dismantlement (glovebox and tanks size reduction). As a result of HCET technology search results and continuous communication between DOE sites and HCET, one of the technologies that was demonstrated at HCET, Jet Edge-Ultra-High Pressure Waterjet Cutting System, was selected by Rocky Flats and purchased by them for deployment at their site. The unit will be used to size-reduce large sludge tanks at Rocky Flats, Building 774.

Technology Assessment and Evaluation Facilities and Methodology Development:

The main accomplishment of the project in FY02 was the development of three key documents: 1) findings from a review of the national technology evaluation programs; 2) guidance document for the assessment of technologies; and 3) training manual for technology evaluators.

Tool and Sensor Applied Research and Development:

Two technology reports have been completed providing information about the remote harsh-environment surveyor system (RHES) and the in situ pipe video monitoring system. For the former, the position tracking system, laser model Accurange 4000-ret, was tested successfully in tracking a reflective target. For the latter, a laboratory test showed video reception from inside four pipe loop configurations at a distance of 60 feet.

Tool and Sensor Delivery Platform Research and Development:

Foster-Miller's pipe mouse system has been chosen for development because of its advanced capabilities rather than having HCET design an in situ pipe robotic crawler.

Technology Deployment:

The Integrated Floor Decontamination and Characterization System (IFDCS) had been deployed at Rancho Seco Nuclear Power Station, to decontaminate about 1,500 sq. ft. of floor area. Preliminary data suggest decontamination factors in the mean range of 2-81, with a factor as high as 1,000 in one grid. The search for gamma imaging technologies has provided several that can perform gamma source detection, as well as visual inspection/location of the sources.

Long-term Monitoring and Stewardship for DDFA:

Based on a 30% design review, a proposed air monitoring system will have multiple sampling capability and will monitor both alpha and beta particles.

Aerosol Research, Development, and Modeling to Support D&D Operations:

A literature search found 23 aerosol models that were screened to review their predictions for the concentrations of airborne particles released under various conditions. Based on the characteristics of air particulates generated during D&D operations and the performance of the screened models, the CALINE 3 dispersion model, which is EPA recommended, was selected as the basic model.

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International Agreement with AEA Technology

Objective and Scope: Through an International Agreement, AEA Technology supports DDFA by providing knowledge and expertise to address specific deactivati on and decommissioning problems throughout the DOE weapons complex. AEA also provides proven technologies and systems from the United Kingdom and Europe to address site-specific problems here in the United States.

Specific activities for AEA in FY2002 have not been finalized due to delays in obtaining a final budget. However, it is planned that AEA will continue to support the FY2001 efforts for deployment of the ArtisanTM Manipulator at Battelle Columbus and at Hanford, and the retention basin access and sampling effort at INEEL. Other activities that AEA may be involved in include Tank Waste Recovery at LANL, Decontamination of Large Diameter Spheres also at LANL, and Duct Decontamination at Hanford. Recently, Fluor Hanford has requested AEA assistance on a requirements-based strategic assessment of needs for processing of large, contaminated equipment by multiple projects at the Hanford site. Over the next ten years a number of facilities at Hanford will be undergoing decommissioning activities requiring the processing and disposal of equipment such as contaminated gloveboxes, ducts piping, and process vessels. The Fluor Hanford Working Group conducting the assessment will perform an alternatives analysis to investigate options for integrating the development and acquisition of capabilities to support multiple projects at the Hanford site. AEA's experience, lessons learned, and capabilities used at other DOE Sites and internationally, would benefit this assessment and be considered in developing the path forward strategy.

Status, Accomplishments, and Current Reporting Period Activities:

Deployment of a Sludge Mobilization System Using a Remote Controlled Articulating Nozzle

As the first step in the closure of the WD complex at Mound, the 33 waste tanks must be emptied and removed. In FY01, AEA Technology transferred the successful Small Tank Mixing (STM) system from Oak Ridge National Laboratory to Mound for demonstration on two concrete storage tanks. AEA Technology then designed a rotational nozzle for demonstration with the STM. When the initial phase of the demonstration was completed, it was determined that the rotational nozzle was very successful in removing the bulk waste from the tanks, but was not as effective in removing the crusted carbon sludge from the sidewalls of the tanks. After consultation with the site and DDFA representatives, it was agreed that a remote controlled articulating nozzle might be capable of removing the crusted sludge. This project will modify the Small Tank Mixing system to use a remote-controlled articulating nozzle to clean the concrete tank surfaces coated with crusted sludge to a target cleanliness standard identified in the scope of work to enable the tanks to be considered "clean" and then removed.

AEA Technology successfully deployed the Small Tank Mixing system with a modified nozzle assembly to mobilize and retrieve the contents of two storage tanks. The system operated efficiently and effectively and the site included the system as part of an RFP to D&D the entire facility.

Deployment Support for the ARTISAN™ Telerobotic Arm System at Hanford's Building 324

In collaboration with the Office of Science and Technology and Hanford's River Corridor Project (RCP), AEA Technology has designed and fabricated a robust, hydraulic manipulator system that has a greater reach and higher payload capacity at full extension than the baseline MSMs. The tele-operated manipulator system, known as the ARTISAN™, was assembled to the specifications provided by the 324 Facility personnel, and will be deployed through the 324 hot cells' standard 10" (25.4cm) manipulator ports. The basic

through-wall configuration of the ARTISAN™ will be delivered to the 324 Hanford Facility and deployed soon thereafter. This hydraulic manipulator system provides RL with the ability to handle waste materials, deploy size-reduction tooling, assist with inspection and assessments of radiological hot cells, and provide the ability to deploy radiological decontamination tooling for the 324 facility hot cells and tanks. The ARTISAN™ Manipulator system will significantly reduce maintenance time, labor, and potential personnel radiological exposure when compared to using the existing MSMs. The ARTISAN™ will also improve operational efficiencies as well as support established Hanford Site As Low As Reasonably Achievable (ALARA) radiological standards and goals established for 324 facility personnel. These operational advantages will lead to acceleration of critical path schedules for facility deactivation and stabilization.

AEA Technology responded to requests from Hanford for minor design modifications and enhancements. Upon completion of fabrication, the entire system was Factory Acceptance Tested at AEA's facility in Pittsburgh. The system passed the acceptance testing and was delivered to the Hanford site. It is expected that the system will be installed in a mock-up facility for operator training in early FY03 with eventual deployment in the hot cells planned for the second quarter of FY03.

Demonstration of a Tank Waste Retrieval System in the TA-50 Tanks at Los Alamos National Laboratory

Like many other DOE sites such West Valley, Fernald and Idaho, the TA-50 Facility at Los Alamos National Laboratory (LANL) has a number of storage tanks with unique geometries. The properties, quantities and disposition of the waste in these tanks are unknown; however, it is believed that they contain residual waste that may also be encrusted onto the walls, and could contain a quantity of solid debris. The presence of this waste is an impediment to either site closure or to safe and efficient site operations and a method is required to mix, mobilize, and retrieve the waste from these tanks.

In FY00, AEA Technology prepared a conceptual design of a retrieval system under PTP reference TFA/PF/32/v1 entitled, *Conceptual Design of a Tank Mixing and Retrieval System.* Also in FY00, a series of proving trials for a conceptual design of the fluidic pulse tube mixing system for retrieving wastes from a series of tanks at LANL was conducted at AEA Technology's facility in Charlotte, North Carolina under Project Technical Plan TFA/PF/33/v1, entitled *Cold Demonstration of a Tank Mixing and Retrieval System For Los Alamos.* The trials established the behavior of the proposed system with each major waste type expected to be encountered at the site and provided design information, which was then passed on to the system designers for incorporation into the final design. During the trials, the mixing nozzle was manually moved around the tank. In fiscal year 2001, AEA Technology advanced the design of the system, taking the conceptual design through to the detailed design under PTP reference TFA/PF/47/v1 entitled, *Demonstration of a Tank Mixing and Retrieval System for Los Alamos National Laboratory*. The system was successfully demonstrated at AEAT's facility in Charlotte, North Carolina using an existing tank. The system efficiently used Power Fluidics with a directional nozzle to dislodge encrusted waste from the tank walls and corners.

This PTP is 50% funded by the LANL site and will continue this work, enabling the completion of the detailed design, fabrication of the system and deployment at the site to recover sludge waste from the tank. AEA Technology will provide support to the installation at the site, the Operational Readiness Review, and to the identification of suitable candidate tanks for subsequent deployment of this system at LANL. AEAT will also prepare a Final Report on the TA-50 deployment and a presentation of the Project Work at a national D&D conference.

AEA Technology delivered the skid-mounted waste mobilization and retrieval system to LANL after a successful factory acceptance test, witnessed by representatives from LANL. The system will be installed in the TA-50 tank and the operators will be trained by AEA Technology. The system will be operated during FY03.

Demonstration of a Remote-Operated Tank Waste and Debris Retrieval and Sampling System in Tanks at Los Alamos National Laboratory

Across the DOE complex, there is a need for the sampling and inspection of "high risk"

underground storage facilities, before their decontamination and decommissioning and subsequent site closure. For example, sampling and eventual closure of the retention basin at Idaho National Engineering and Environmental Laboratory (INEEL) is a requirement under a voluntary consent order (VCO) between INEEL and the State of Idaho. This and other facilities such as the Knolls Atomic Power Facility could benefit from the deployment of a simple mechanical arm, currently being developed by AEAT. In response to site needs such as these, AEAT designed and tested a simple mechanical arm capable of being deployed in underground storage tanks to perform a variety of tasks, including; visual inspection, sampling, dosimetric readings, and limited waste retrieval.

In FY02, AEA Technology proposed to deploy this system in the General's Tanks at LANL. As part of this project, AEAT will create an outline and a detailed design of the inspection and sampling system for LANL as well as develop, manufacture, and test the system including specialized tooling to capture and retrieve samples, and a camera and light source for tank inspection. After the system is tested, it will be delivered to LANL, with AEAT providing support to the installation in each tank and technical oversight of the operation on site. AEAT will also liaise with INEEL and Knolls Atomic Facility personnel to finalize the deployment strategies for their projects in FY 2003 and FY 2004.

The system design was initiated and some testing completed. Unfortunately, unforeseen delays at the sites have resulted in a delay in this project. AEA Technology is awaiting technical information from the site before completing the design of the system. The site are aggressively pursuing an excavation activity to collect the information required. Once the information has been supplied, AEAT will complete the design and fabrication of the system. The system will then be tested before being shipped to LANL for deployment. The entire project team, including LANL, is committed to the deployment of the sampling system after the prerequisite work has been completed.

High Activity Waste Minimization by In-Tank Chemical Destruction of Organic Resins

Oak Ridge National Laboratory (ORNL) is currently building a facility to hold TRU liquid waste at the site in a container suitable for long-term storage. Tanks T1 and T2 at the Oak Ridge Reservation are two 15,000-gallon TRU underground storage tanks. The TRU waste in the tanks is mixed in with and attached to an organic resin that was placed in the tanks. Unfortunately, the new plant being built at the site cannot accept waste contaminated with organics. Conventional methods such as acid stripping have been unsuccessful in removing the TRU waste from the resins.

AEA Technology and ORNL are currently considering a process known as wet oxidation to destroy the organic content of the waste, enabling the TRU waste to be transferred to the new processing and storage facility. AEA Technology will design, fabricate, test and deploy a system to retrieve the waste from the storage tanks, separate the organic components, and transfer the waste to the interim storage facility. This project will address a major problem at Oak Ridge and provide the site with the capability to meet the aggressive schedule established for accepting waste at the interim storage facility. Failure to meet this schedule will force the site to identify an alternative disposal or storage route for the waste in the two tanks because the waste treatment contractor, Foster Wheeler, will no longer be obligated to accept additional waste.

AEA Technology submitted safety documentation and preliminary design information. The project will progress to detailed design and fabrication in FY03.

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Small Business Innovation Research (SBIR) Program

Objective and Scope: The SBIR Program was established in 1982 under the Small Business Innovation Development Act. The objectives of the Program are to stimulate technological innovation, use small business to meet federal research and development (R&D) needs, encourage the participation by disadvantaged and minority persons in technological innovation and increase private sector commercialization derived from federal R&D.

In December 2000, the SBIR Program was re-authorized until September 30, 2008. Congress concluded that the SBIR program was successful in providing small businesses with opportunities to compete for federal R&D awards and that the SBIR had effectively stimulated commercialization of the resulting technology, benefiting both private and public sectors.

SBIR programs fund R&D efforts of a high-risk nature that have high commercial potential. Under the Small Business Innovation Development Act, each agency with an extramural R&D budget in excess of $100 million must establish an SBIR Program.

The SBIR Program is a three-phase process. Phase I is based on proposals submitted in response to solicited research topics by participating agencies. The purpose of Phase I is to evaluate and demonstrate the scientific and technical merit and feasibility of an idea. Phase I proposals describe the projected results of the proposed research, the approach to be used and how it will prove the feasibility of its approach. Phase I research efforts are typically six months in duration and awards normally do not exceed $100,000.

Companies that successfully complete Phase I can compete for Phase II funding to expand on Phase I results and continue development of the technology. Phase II is the principal R&D effort, generally lasting 24 months. Awards typically do not exceed $750,000.

Status and Accomplishments: The current Phase I projects include:

(1) Aspen Systems, Inc.— Personal Cooling System

(2) Radiation Monitoring Devices, Inc.— A High Sensitivity Beta Imaging System for Surface Assessment

(3) YAHSGS LLC/Oak Ridge National Lab— Total Online Access Data System

(4) Physical Optics Corporation— An Advanced Real-Time Data Management System

The current Phase II projects include:

(1) ARM Automation, Inc.—Modular Robotics for Delivering On-Site Contamination Sensors and Mapping System to Difficult-to-Access Locations

(2) AUTOMITIKA, Inc.—PipeTaz: Automated Pipe Asbestos Insulation Removal System

(3) ADA Technologies, Inc.—Portable Multicontaminant Detection Instrum entation for R&D

(4) Intelligent Optical Systems, Inc.—Intelligent Unmanned Monitoring of Remediation Sites

(5) X-Ray Optical Systems, Inc.—Compact Polycapillary Based Microbeam X-Ray Fluorescence Analysis System for Remote Monitoring of Metal Contamination

(6) Radiation Monitoring Devices, Inc.— An Advanced Avalanche-Photodiode Based Spectroscopic Radiation

(7) Photon Imaging Inc., Portable XRF System

Current Reporting Period Activities:

Modular Robotics for Delivering Sensors to Difficult to Accesss Areas—

The body of the mobile system is complete with only two subsystems yet to be added and tested together. These include the Pan/Tilt camera unit and the robotic manipulator arm. The cart's drive system has been tested along with the battery bank and re-charging system. The vertical mast that provides for the extended high-reach of the arm has been fitted to the cart and is operational.

The development of the next larger size of modular robotic joint is in progress and will utilize the same DISC controller as the wheel drives and the vertical mast motor, thus simplifying the overall system from a controls standpoint. This modular arm will incorporate several refurbished joints from an existing manipulator. These refurbishments are now complete and await the addition of the largest joint (the shoulder). This aspect of the project is approximately 20% behind schedule; however, more resources will soon be freed up to

double team this thrust and should bring it back to plan by December.

The sensor suite that will be carried by the remote system is in hand. ARM is awaiting a shield element, which is to be built by Savannah River. This element will hold the sensor head that will be mounted on the end of the robotic arm.

The overall system controls are approximately 60% complete. These tie together the robot's cart motion, cameras, sensors and arm. This software also records the data that will be recovered by the sensor. This database is ahead of schedule and offsets some of the lag in other areas.

The demonstration effort will follow the final testing according to plan. This should occur at the Savannah River Site sometime near the end of March 2003.

An Advanced APD-Based Spectroscopic Radiation Imager - Since choosing the FET-APD readout scheme, an examination of the discrete components required for implementation and package design issues has been started is now well underway. Several discrete-component readout scheme variants have been modeled and preliminary circuitry is assembled. The multi-channel, pulse-processing scheme has moved into the laboratory, where it is now under use for reading out an APD array. The ASIC readout supports the readout of 16 channels per ASIC. The number of readouts required for the sensitized imager is 84 so that six ASICs must be used. Mutliplexing schemes to reduce the amount of channels required for digitization are currently being examined.

Several diode-backed arrays have been fabricated and packaged at the APD foundry. Ceramic substrate designs for joining the arrays with external circuitry are currently being examined. This ceramic substrate will be highly complex as it has to support many high-voltage interconnections, signal leads, and ground leads all within a very small package. Several aperture designs have been made and discussed with machinists and engineers at RMD. The size of the mask and the difficulty of machining Tungsten has made the fabrication of the entire aperture from one piece of Tungsten unfeasible. The ability to assemble masks from repetitive subunits is being examined.

PipeTaz: Automated Pipe Asbestos Insulation Removal System—

The PipeTaz fabrication and assembly started in May and is progressing on schedule.

- A mock up of the system was built to aid in system packaging and electronics configuration. The final system is now being built.
- The pipe-feed mechanisms are complete.
- The electronics, user interface, power- and computer-enclosures and schematics are being fabricated and assembled.
- Testing is expected in early 2003, and a demonstration will be held by June, 2003 with a local abatement company.

Portable XRF System—

Photon Imaging, Inc. is currently working on a Phase III effort to commercialize the technology. The prototype portable XRF system has been demonstrated for two large companies that are seriously considering incorporating this detector as an OEM part into their XRF instruments. Sales of this product are expected for next year that could reach $1 million for 2003. The final report for Phase II has been completed.

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2.2 Facility Characterization

Technology for Real-Time Measurement of Surface and Airborne Beryllium

Objective and Scope: The objective of this contract is to develop, test, and demonstrate an innovative real-time monitor for surface and airborne beryllium. This field-portable device is based on Laser-Induced Breakdown Spectroscopy (LIBS) and will be applicable to continuous air monitoring, field analysis of filters from personal air monitors, and analysis of surface wipe samples. Another potential application is a point and shoot device for direct measurement of beryllium on a surface. Accurate and timely detection and monitoring of beryllium is critical to worker safety during deactivation and decommissioning activities. Beryllium dust is a significant workplace hazard. Exposure to beryllium particles can cause chronic beryllium disease (CBD)—an irreversible and sometimes fatal scarring of the lungs—in certain people. Beryllium metal has been produced for various industrial uses and has been widely used in aerospace and defense applications. The baseline method for beryllium analysis is sending samples to an off-site laboratory, which may require days or weeks to obtain results. RFETS, ORNL, Y-12, LANL, and DoD have beryllium issues.

Status and Accomplishments: On September 30, 2000, a contract was awarded to Science Engineering and Associates (SEA) to develop a technology for Real-Time Measurement of Airborne and Surface Beryllium. The Lovelace Respiratory Research Institute (LRRI) was awarded a subcontract to prepare various beryllium on filter samples for SEA, provide laboratory space at LRRI facility for SEA to conduct LIBS measurements of the beryllium filters, and provide consultation related to the design of the beryllium monitor.

Current Reporting Period Activities: SEA is awaiting guidance from DOE, specifically RFETS, to schedule delivery of the instrument to RFETS for operator training and demonstration of the instrument's continuous air monitor (CAM) function. This will replace the previously scheduled demonstration at the Lovelace Respiratory Research Institute, which retook the lab space set aside for SEA.

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2.3 Facility Decontamination

Technology Deployment for Asbestos Destruction

Objective and Scope: Asbestos Recycling Incorporated (ARI) was awarded a contract to process 10,000 pounds of asbestos containing material (ACM) from SRS. ARI's thermochemical treatment unit consists of modular components designed for hazardous waste treatment. The system will be used to remineralize asbestos resulting in non-toxic, non-regulated, asbestos-free aggregate suitable for recycling. The modular systems include a waste pretreatment system, a rotary hearth, an off-gas processing system, and a product-handling system. These systems are designed to accommodate a variety of waste types and contaminants.

Status and Accomplishments: The contract was awarded to ARI on September 30, 2000. In early October 2000, ARI coordinated with DOE's Savannah River complex and DOE's asbestos abatement contractor to arrange for abated asbestos to be picked up by ARI's selected trucking contractor. ARI contracted with Freehold Cartage, Inc., Eutawville, South Carolina, to pick up the asbestos and transport the material to ARI's facility located in Tacoma, Washington. The asbestos was loaded onto the Freehold Cartage truck on October 18, 2000 and was transported without incident to Tacoma on October 23, 2000. The 441 bags of asbestos were unloaded into a steel shipping container, which was then properly labeled and locked. The asbestos will remain in storage until processed.

ARI assembled the thermochemical conversion unit that will destroy the Savannah River Site asbestos waste at their Tacoma facility.

Current Reporting Period Activities: The project was completed on August 30, 2002.

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2.4 Facility Dismantlement and Material Disposition

Robotics Crosscutting Program

Objective and Scope: The Robotics Crosscutting Program (Rbx) supports the DDFA through design and integration of remote systems and capabilities used for near-term facility deactivation and ongoing surveillance and maintenance activities with extended application to final facility decommissioning. Deployment of remote D&D systems will reduce worker exposure to hazardous environments and provide productivity increases leading to substantial cost savings. The Rbx also provides the technical interface for ongoing activities conducted by NETL Industry Programs, the University Research Program in Robotics (URPR), and the EMSP in the area of remote/robotic systems development for D&D applications.

During FY2002, the Rbx D&D Product Line will focus on incorporating applicable research results from other DDFA-funded research projects into the development of telerobotic manipulation systems targeted for field deployment. Telerobotic manipulation systems are the next generation technical solution to remote manipulation problems that currently rely on purely teleoperated task execution. Telerobotic manipulation systems allow computer-controlled execution of portions of the manipulation task, increasing task execution efficiency. In particular, the Rbx D&D Product Line will develop and evaluate candidate control technology components applicable to telerobotic manipulation systems and develop, demonstrate, and deploy specific telerobotic manipulation systems.

Status, Accomplishments, and Current Reporting Period Activities: At Oak Ridge National Laboratory (ORNL), modifications were completed to the Telerobotic Manipulation System (Tech ID 2181) and telerobotic capability was verified, demonstrated, and videotaped for plasma cutting of flat plates and structural angle. Paths were planned and executed for cutting operations on large cylinders to verify that the technique would work there as well. At Pacific Northwest National Laboratory (PNNL), the ORNL T2 controller hardware has been assembled and run in the 1444 laboratory. These activities complete FY2002 milestones as recorded in the Technical Task Plan. These activities are terminated as of close of business September 30, 2002.

Also, at PNNL, Rbx staff continued further enhancements to the controller for the Cybernetix arm. Work included improving the text-based operator interface for the joysticks, implementing Cartesian tool control, improving speed, and better tracking of set points. Finally, configuration of the high-level controller (HLC) and arm-level controller (ALC) in support of the University of Tennessee at Knoxville (UTK) robot task space analyzer contract with DOE-National Energy Technology Laboratory (NETL) was completed. UTK has received verbal confirmation of extension of their current contract through January 2003. The HLC and ALC will be loaned to UTK for the duration of that existing contract after which the entire system will be delivered to ORNL.

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Electro-Hydrostatic Transmission and Control Technology for Modular D&D Manipulators

Objective and Scope: Remote D&D operations demand manipulators that can accommodate heavy payloads and generate high forces. In spite of their many drawbacks, hydraulic systems are currently used. Automation requirements unique to DOE demand use of modular architecture and a system of pre-engineered actuators and links that can be quickly combined to create a manipulator tailored to specific tasks with the capacity to handle heavy payloads. The objective is the development of a manipulator that uses electro-hydrostatic control and actuators. The manipulator's actuator module will have torque density significantly higher than current technology. In Phase I, control algorithms for electro-hydrostatic actuators will be developed and proven on a test-bed to verify the feasibility of the approach.

In Phase II, a complete integrated electro-hydrostatic actuator (EHA) will be designed, fabricated, and tested. In Phase III, the complete integrated EHA will be tested at a DOE field site. The contract is based on the first two phases, with the third phase optional.

Status and Accomplishments: The contract was awarded to ARM Automation, Inc. on September 28, 2001. The survey of hydraulic transmissions is complete. Over 40 manufacturers were contacted for product information.

Current Reporting Period Activities: The construction of the test-bed consisting of ARM's Distributed Intelligent Servo Controller (DISC), a motor, hydrostatic pump and motor, sensor, instrumentation and a load was completed. Testing began in late August.

For more information:

Tech ID 3165

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Transmission-Based Electrical Servoactuators

Objective and Scope: The project objective is to develop and test transmission-based electrical servoactuators (TBAs) to extend the operating range of electrical servoactuators and demonstrate their commercial viability. The work will focus on D&D applications. Many D&D projects will use robotics and remote handling systems, especially when radiation exposure levels are high. Such systems may also be used to reduce labor costs in highly repetitive operations. Because of the low power and torque density of common electrical servomotors, systems in the payload range required by D&D are almost always implemented using electrohydraulics. While servoactuators used in hydraulic manipulators have much greater power density, they introduce much higher complexity and cost throughout a system's life cycle, which has a direct impact on EM project costs.

The goal of this applied research project is to achieve significant increases in the power-to-weight ratios of the electrical servoactuators so they can be used on future remote manipulator systems. The fundamental idea is to incorporate a multi-speed transmission to "spread" a servomotor's torque-speed characteristics across a wider output speed range. This has the effect of allowing smaller, high-power electrical motors to also deliver high torque at low speeds. By using a multi-speed transmission similar to common practice in automobiles, the motor size can be reduced dramatically while increasing overall power to weight ratio in the process. The fundamental research challenges are believed to be associated with transmission miniaturization and the achievement of smooth servo control during transmission ratio variations. Successful research results would allow electrical servoactuators to be used in virtually every application required in environmental cleanup projects ultimately resulting in increased reliability, enhanced maintainability and reduced equipment costs. Phase I of the project will assess the basic feasibility of transmission-based electrical servoactuators. In Phase II, a pre-commercial prototype will be developed and tested.

Status and Accomplishments: This project was initiated in October 2001. Technical requirements for concept development were established. Conceptual design was completed for development of transmission-based electrical servoactuators prototypes. Studies of methods and hardware have been completed. Detailed design of a prototype is ongoing. Solid models of planetary gear sets have been created using AutoCAD Inventor. Schematics were created for two different discrete gear designs (one with a clutch, one without) that offer the necessary speed reductions.

Current Reporting Period Activities: As conceptual design is being completed, the transition to detailed design has revealed some factors that have caused reconsideration of assumptions used in the conceptual design. First, additional information describing several commercial planetary gear sets revealed that most were not appropriate candidates for use with Transmission Based Electrical Servactuators. This additional information has also provided insight into

the relative difficulties in fabricating and assembling components into a usable system. To assist in the decision-making, it was decided that a steady-state model of the three-state transmission would be useful. This model obviously will not provide instantaneous dynamic loading information, but it will be useful in giving detailed steady state information regarding velocities and torques of each gear and carrier in the system. For simplicity, a spreadsheet format was chosen. The model should provide the capability to change conditions of constraint and motion transfer throughout the gear sets to facilitate "what-if" considerations. The equations that govern the speeds and torques can also be used in the dynamic model to provide information not currently available.

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3.0 Programmatic Structure and Organization

The Office of Science and Technology (OST), as part of DOE's Office of Environmental Management (EM), manages a national program to conduct basic and applied research, and technology development/demonstration/deployment that is essential to completing a timely and cost-effective cleanup of the DOE nuclear weapons complex. OST provides environmental research results, as well as cleanup technologies and systems to meet EM program high priority science and technology needs while reducing technological risks and cost of implementation of effective solutions. The OST works closely with both the Office of Site Closure (EM-30) and the Office of Project Completion (EM-40) to accomplish its mission.

To achieve a comprehensive, integrated approach to developing and providing science and technology solutions, EM has separated the site cleanup needs into a set of five problem areas. A Focus Area has been established to plan and manage EM's research and development investments to develop solutions to each of these five problem areas:

- Deactivation & Decommissioning Focus Area
- Tanks Focus Area
- Nuclear Materials Focus Area
- TRU and Mixed Waste Focus Area
- Subsurface Contaminant Focus Area

In addition, three crosscutting technology areas were established where technology needs and targets are relevant to more than one Focus Area:

- Characterization, Monitoring and Sensor Technology (CMST)
- Efficient Separations and Processing (ESP)
- Robotics

The Industry Program conducts competitively selected activities that involve the private sector in developing, demonstrating, and implementing improved technologies that address the needs of the focus areas and the crosscutting areas.

The result of this structure of programs is that the D&D Focus Area is positioned to support those research areas defined as highest priority by EM-50 and DOE customers.

The Role of NETL

The Federal Energy Technology Center, with physical sites in both Pittsburgh, Pennsylvania and Morgantown, West Virginia, was designated as the National Energy Technology Laboratory (NETL) in December 1999. As the 15th national laboratory, NETL becomes part of the national laboratory research system. This is the largest research system of its kind in the world with more than 30,000 engineers and scientists conducting research and research and leading-edge experiments. As part of this system, the new National Energy Technology Laboratory will join Argonne National Laboratory (Illinois); Brookhaven National Laboratory (New York); Lawrence Berkeley National Laboratory (California); Fermi National Accelerator Laboratory (Illinois); Idaho National Engineering & Environmental Laboratory (Idaho); Lawrence Livermore National Laboratory (California); Los Alamos National Laboratory (New Mexico); National Renewable Energy Laboratory (Colorado); Oak Ridge National Laboratory (Tennessee); Pacific Northwest National Laboratory (Washington); and Sandia National Laboratories (New Mexico and California).

Rita A. Bajura, NETL Director, a career federal executive with more than 20 years experience in government-industry energy partnerships, continues in her leadership position as head of the single management team that serves both physical sites with a combined working force of more than 530 federal scientists, engineers, and administrative staff. NETL is responsible for nearly 600 research projects; most involving the development of advanced fossil fuel technologies.

The new national laboratory's core capabilities include the Center for Advanced Natural Gas Studies and the National Petroleum Technology Office (NPTO) in Tulsa, Oklahoma.

Senator Robert C. Byrd (D-WV) remarked in the course of the dedication that, "Much of the laboratory's work is dedicated to the worthy goal of developing innovative, clean and efficient technologies that will allow our nation to meet its growing energy needs."

As the nation's newest national laboratory, it will continue to help light a pathway for a new era of energy use that will ensure a comfortable standard of living for our children and our children's children."

NETL also manages a significant portion of the technology development needed to clean up sites in the government's nuclear weapons complex. In February 1995, the then Morgantown Energy Technology Center was selected by EM-50 to be the implementing organization for the D&D Focus Area. As such, it brought the experience gained from being the implementing organization for the Industry Program, which competitively selects industrial R&D performers through Research Opportunity Announcements (ROAs) and Program Research and Development Announcements (PRDAs). As the lead organization for D&D implementation, NETL is responsible for the planning, monitoring, and evaluating research development demonstration testing and evaluation (RDDT&E) projects to meet the requirements of EM-50 and its customers in EM-30.

"Much of the laboratory's work is dedicated to the worthy goal of developing innovative, clean and efficient technologies that will allow our nation to meet its growing energy needs."

Senator Robert C. Byrd (D-WV)

Stakeholder Feedback

The stakeholders in the Deactivation and Decommissioning Focus Area (DDFA) include DOE headquarters; DOE operations offices; DOE sites and their operating contractors; DDFA technology developers and users in the private sector; federal, state, and local regulators; and the communities around affected DOE facilities. These stakeholders have been providing input to focus area planning and implementation; program contacts are provided on the first page of this report.

4.0 Background

The D&D Focus Area was established to develop and demonstrate improved technologies and systems that could solve customer-identified needs to characterize, deactivate, survey and maintain, decontaminate, dismantle, and dispose of or recycle DOE surplus facilities and their contents. The mission also includes facilitating the acceptance, approval, transfer, commercialization, deployment, and implementation of these technologies and systems.

These technologies are needed to address the pressing needs of deactivating more than 7000 contaminated buildings and decommissioning more than 700 buildings. In addition, material disposition is required for over 600,000 tons of metal and 23 million cubic meters of concrete in contaminated buildings and for 400,000 tons of metal currently in scrap piles. The major drivers for this focus area are the high safety and health risks associated with working in aged and contaminated facilities and the high costs associated with facility deactivation, sur-veillance, and maintenance using currently available baseline technologies.

D&D Focus Area Strategy

Subsequent to the selection of NETL as the lead organization for the D&D Focus Area, a program review of all FY95 projects was held in May 1995. Based on this and other recent program reviews, as well as the general requirement for fiscal constraint throughout, the following strategies were developed:

Programmatic Strategy

- Focus D&D technology development program on large-scale demonstrations emphasizing full-scale demonstrations using a suite of improved technologies.
- Demonstrate technologies only through large-scale demonstrations.
- Focus on technologies that are identified as high priority by customers, that have wide applicability, and that have a commitment to be considered for use by customers.
- Emphasize demonstration and deployment of private-sector technologies.
- Technical Strategy

In the near term, emphasize technologies to effectively support:

- deactivation of facilities,
- decontamination of surfaces,
- reuse of bulk contaminated materials,and
- application of remotely operated dismantlement systems

In the middle term, emphasize technologies to effectively support:

- applications of remote surveillance systems,
- characterization of volumetrically contaminated materials,
- decontamination of bulk materials, and
- adoption of release standards for bulk contaminated materials.

Large-Scale Demonstrations and Deployment Projects

A cornerstone of the D&D Focus Area is its series of large-scale demonstration and deployment projects. The LSDDPs demonstrate innovative and improved D&D technologies at full scale, side by side with existing commercial technologies. The intent is to compare benefits from using a suite of improved and innovative D&D technologies against those associated with baseline D&D technologies. This approach provides an opportunity to test improved and innovative D&D technologies at a scale that will provide meaningful cost and performance information to the potential end-users of the technology.

5.0 Upcoming Events

February 2003

Waste Management '03

February 24-28, 2003
Tucson, Arizona
http://www.wmsym.org/wm03/Index.html

We list conferences and workshops of interest to our readership.
Please let us know if you would like us to include your event on this page.
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6.0 Acronyms

3D	Three Dimensional
3DICAS	Three Dimensional Integrated Characterization and Archiving System
ACM	Asbestos Containing Material
ACS	Advanced Characterization System
AEAT	AEA Technology
ALARA	As Low As Reasonably Achievable
APP	Automated Plutonium Processing
ARI	Asbestos Recycling Incorporated
ASME	American Society of Mechanical Engineers
ASTD	Accelerated Site Technology Deployment
BGD	Below-Grade Duct
BGRR	Brookhaven Graphite Research Reactor
BN	Bechtel Nevada
BNFL	British Nuclear Fuels
BNL	Brookhaven National Laboratory
CAEM	Continuous Air and Emission Monitoring
CAM	Continuous Air Monitor
CBD	Chronic Beryllium Disease
CDI	Canyon Disposition Initiative
CEM	Continuous Emission Monitoring
CEMP	Columbus Environmental Management Project
CLE	Contaminated Large Equipment
CLR	Coherent Laser Radar
CMST	"Characterization, Monitoring and Sensor Technology"
CP-5	Chicago Pile 5
CRC	Compact Remote Console
CSI	Cambell Scientific Incorporated
DDFA	Deactivation and Decommissioning Focus Area
DoD	Department of Defense
DOE	Department of Energy
DVRS	Decontamination and Volume Reduction System
EM	Environmental Management
EMS	Excavation Monitoring System
E-PERM	Electret-Passive Environmental Radiation Monitor
EPRI	Electric Power Research Institute
ESH	"Environment, Safety, and Health"
ETF	Effluent Treatment Facility
EVS	Environmental Visualization System
FEMP	Fernald Environmental Management Project
FIU	Florida International University
FIU-HCET	Florida International University's Hemispheric Center for Environmental Technologies
FSB	Fuel Storage Basin
FY	Fiscal Year
GLD	Gamma Locator Device
HAMMER	Hazardous Materials Management and Emergency Response Training and Education Center
HCET	Hemispheric Center for Environmental Technologies
HEPA	High Efficiency Particulate Air
HFBR	High Flux Beam Reactor
HSGC/MS	High-Speed Gas Chromatography/Mass
HVAC	"Heating, Ventilation, and Air Conditioning"
IC	Integrated Contractor
IECS	Integrated Excavation Control System
IID	Isotopic Identification Device
IMMS	Improved Measurement and Monitoring System
INEEL	Idaho National Environmental and Engineering Laboratory
ISOCS	In Situ Object Counting System
ISSRS	In Situ Size Reduction System
ITRD	Innovative Treatment and Remediation Demonstration
ITSR	Innovative Technology Summary Report
IUOE	International Union of Operating Engineers
LANL	Los Alamos National Laboratory
LARADS	Laser Assisted Ranging and Data System

LIBS ..... Laser-Induced Breakdown Spectroscopy
LLNL ..... Lawrence Livermore National Laboratory
LRAD ..... Long Range Alpha Detector
LRRI ..... Lovelace Respiratory Research Institute
LSA ..... low specific activity
LSC ..... Liquid Scintillation Counting
LSDDP ..... Large Scale Demonstration and Deployment Project
LTC ..... "LTC Teletrak, Inc."
LTS ..... Long Term Stewardship
MAES ..... Mechanical and Aerospace Engineering and Engineering Science
MARSSIM ..... Multi-Agency Radiation Survey and Site Investigation Manual
MEMP ..... Miamisburg Environmental Management Project
MOU ..... Memorandum of Understanding
MTR ..... Membrane Technology and Research
MVS ..... Molecular Vibrational Spectrometer
NETL ..... National Energy Technology Laboratory
NMR ..... National Center of Excellence for Metals Recycling
NRC ..... Nuclear Regulatory Commission
NTS ..... Nevada Test Site
ORNL ..... Oak Ridge National Laboratory
OSDF ..... On-Site Disposal Facility
OST ..... Office of Science and Technology
PCA ..... Principle Component analysis
PCB ..... Polychlorinated Biphenyl's
PFT ..... Perfluorocarbon Tracer
PNNL ..... Pacific Northwest National Laboratory
PPPL ..... Princeton Plasma Physics Laboratory
PuSPS ..... Plutonium Metal and Oxide Processing System
QA/QC ..... quality assurance/quality control
R&D ..... Research and Development
Rbx ..... Robotics Crosscutting Program
RCRA ..... Resource Conservation and Recovery Act
RCT ..... Radiation Control Technician
RFETS ..... Rocky Flats Environmental Technology Site
RFI ..... Rocky Flats D&D Initiative
RL ..... Richland
R-MAD ..... Reactor Maintenance Assembly and Disassembly
ROSRS ..... Remote Operated Size Reduction System
RTSA ..... Robotic Task Scene Analysis
SAMMS ..... Self Assembled Monolayers on Mesoporous Supports
SBIR ..... Small Business Innovation Research
SCO ..... Surface Contaminated Objects
SEA ..... Science Engineering and Associates
SOW ..... Statement of Work
SRS ..... Savannah River Site
SWB ..... Standard Waste Box
TAN ..... Test Area North
TMS ..... Telerobotic Manipulation System
TRA ..... Test Reactor Area
TRU ..... Transuranic
TSDS ..... Technology Safety Data Sheet
TTP ..... Technical Task Plan
TWR ..... Tank Waste Retrieval
UDP ..... Universal/Demolition Processor
UL ..... Underwriters Laboratory
URPR ..... University Research Program in Robotics
UTK ..... University of Tennessee Knoxville
VACIS ..... Vehicle and Cargo Inspection System
WAC ..... Waste Acceptance Criteria
WBS ..... Work Breakdown Structure
WIC ..... Waste Isolation Composite
WIPP ..... Waste Isolation Pilot Plant
XRF ..... X-Ray Fluorescence